THE AMERICAN

GAS-LIGHT JOURNAL AND CHEMICAL REPERTORY

Devoted to the Interests of Illumination, Heating, Ventilation and Sanitary Improvement, Domestic Economy, and General Science.

PUBLISHING OFFICE, No. 42 PINE STREET.

VOLUME XIII.—No. 11. WHOLE No. 263. | NEW YORK, FRIDAY, DECEMBER 2, 1870. | $3 PER ANNUM IN ADVANCE.

McCracken's Patent Gas Apparatus.

We herewith illustrate a new and improved apparatus for manufacturing illuminating gas, in which the tar and condensible products of the coal or other gas producing material, ordinarily unavailable for such purpose are converted into gas, thereby not only effecting a considerable economy in the material required in making a given quantity of gas, but preventing the choking ordinarily experienced of the passages and pipes of the retorts. In the engravings Fig. 1 represents the apparatus constructed to admit the use of steam to insure the object above referred to, and used with a retort of the usual kind. Fig. 2 shows the same apparatus employed in connection with an improved retort; this last itself is shown in Figs. 3 and 4, which are transverse sectional views taken at different places along the length of the retort.

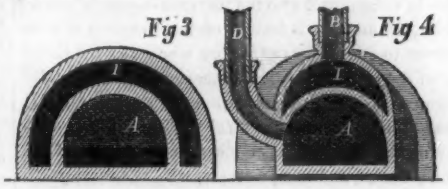
Referring first to Fig. 1, the several retorts, A, are connected in the usual way at the front ends or heads by stand pipes, B, with the hydraulic main C. At the rear end of the upper retort, A, is a pipe, D, through which the tar from the hydraulic main passes to the said retort. Between this pipe, D, and the hydraulic main is the vessel or chamber, E, the lower part of which is in constant and free communication with the lower part of the hydraulic main by means of a pipe, F, and the upper part of which communicates with the pipe, D, by means of a pipe, G. The orifices of this pipe, G, at its communication with the chamber, E, and pipe, D, are so arranged as to provide for the overflow of the tar from the chamber to the pipe, D, and thence to the retort; but to maintain a proper level of the tar in the hydraulic main and in the chamber, which constitutes a trap, such level being always sufficiently above the pipe, F, to form a liquid seal to the said pipe and the chamber, E, and thereby prevent the gas from escaping from the retort by the pipes, D and G, and chamber E, to the hydraulic main. H is the pipe through which steam enters the chamber, E, above the tar therein. Another trap is used to separate the ammoniacal liquor from the tar, and prevent its return to the retort.

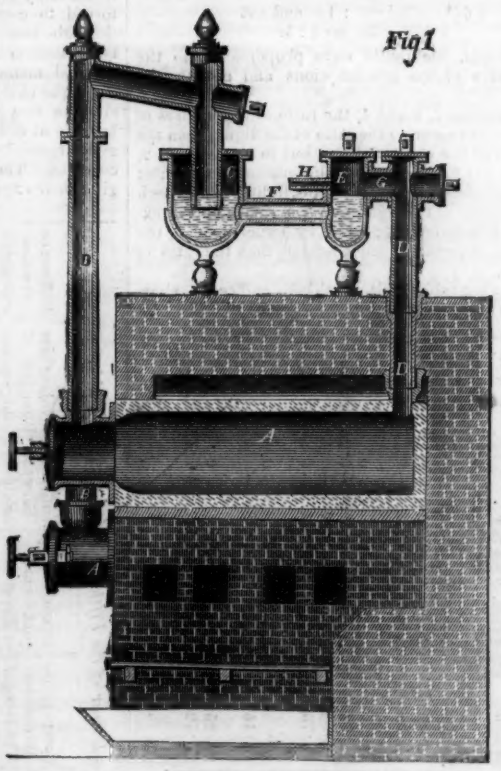
The operation is as follows:—The tar from the hydraulic main, C, flows freely into the lower part of the chamber, E, whence it overflows in a thin stream or film over the lower part of the pipe, G, and down the inner surface of the pipe, D, toward the retort, and the superheated steam entering the said chamber, E, passes therefrom with the tar along the pipes, G and H, to the retort, vaporizing the tar before its introduction into the retort. The superheated steam and vaporized tar, entering the retort together, are easily decomposed in the retort, in which their elements are recombined to produce incondensible gases, which pass from the retort by the pipe, B, to the hydraulic main, whence they pass off in the usual way to the gasometer, leaving no or very little solid deposit adhering to the pipes, D and G, or to the retort.

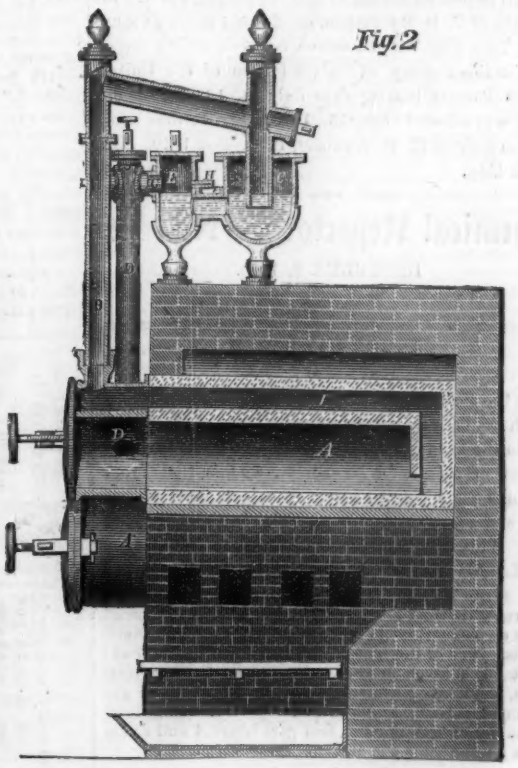
With regard to the peculiar construction of the retort previously mentioned and represented in Figs. 3 and 4, the improvement consists in providing a horizontal retort with a jacket which extends along and all over its top and sides and over its rear end, and which communicates with the lowest part of the interior of the retort and forms the communication between the retort and the stand-pipe—the object being to insure the decomposition and conversion into permanent gas, of the condensible vapors which, in making gas in ordinary retorts, form or are collected with the tar.

The retort may be of various forms, but in the present instance is of the usual D shape. A is the body of the retort, of ordinary form, and I is the jacket extending all along and over the top and over the rear end, and communicating with the interior of the retort by means of a narrow transverse opening extending along the bottom of the rear end. At the front end of the jacket, in the upper part thereof, is an opening with which the stand-pipe for leading off the gas is connected. The retort head needs only to cover the body of the retort, leaving the opening outside for the connection of the pipe.

The retort thus jacketed may be arranged in the bench or furnace in the usual way, and as the jacket is directly exposed to the heat, and the heat can only penetrate the sides, top, and rear end of the retort through the jacket, the latter must be hotter than the body of the retort. The gas generated and vapors, evolved in the body or inner portion of the retort being, owing to the position of the opening, close to the bot-







tom of retort, compelled for the most part to decends through the body of the coal or material in the retort, are subjected very thoroughly to the heat within that portion of the retort, and thereby thoroughly heated before escaping into the jacket, in which they are further so heated that the tar and other condensible matters are decomposed and converted into permanent gas. The construction and operation being understood of the apparatus for using steam in the conversion of tar, etc., into gas, hnd of the retort itself in its improved form, the combined use of these two distinctive features illustrated in Fig. 2, is readily comprehended.

In this improvement of Mr. McCracken there seems to be an entirely new element, which we believe has never been employed in all previous attempts to utilize coal tar to increase the yield of gas. This consists in the employment of a jet of steam which serves, first, to keep the pipes from clogging; second, it enters the retort in combination with the tar and is decomposed by the high temperature of the incandescent contents of the retort, and is converted into carbonic oxyde and free hydrogen, and probably some carbonic acid gas. The free hydrogen combines with the carbon of the tar to form both light and heavy carburetted hydrogen or olefiant gas, while the carbonic oxyde serves to still further increase the volume. This accounts for the increase in volume and also the increase in candle power. The importance of this feature of the invention will be apparent to gas experts and those who study the chemistry of the operation. This theory seems to be fully confirmed in the practical working of the process. It having been in operation several weeks, and fully tested by one of the most experienced gas engineers of the Eastern States, and many others, with the most gratifying results.

We shall make a critical examination of this process and a report of the results will appear in the next number of this Journal.

This improved system of gas manufacture is the invention of E. D. McCracken, of No. 617 Sixth avenue New York City. Patents have been secured thereon both in this country and abroad; two of the United States Patents bearing date July 12, 1870, while another was allowed Sept. 13, 1870. For further information address H. B. Kirkland, P. O. Box 1140, New York City.

Chemical Repertory.--No. 42.

DECEMBER 2, 1870.

Editor—HENRY WURTZ.

FARMER'S THEOREM.

To the communication on this subjet given below which has been forwarded to us by favor of Mr. Stimpson, in the form of advanced sheets of the *American Journal of Science* for November, we find that Prof'r Silliman has appended a note, of which, however, we have had no copy sent to us. We shall give it in our next. This whole subject is reviewed in the issues of the London *Journal of Gas-Lighting* for Oct. 25 and Nov 8, by Wm. Pole F. R. S., etc., who discredits Farmer's theorem altogether, and claims, as the result of his own experiments and analyses of those of others, the discovery of the true law, which he expresses thus: "that in a given burner, taken through its normal range, the light given varies as the quantity of gas consumed, *minus a constant quantity*." L being light, q quantity of gas in cubic feet per hour, A and c constants for the same gas and the same burner

$$L = A\ (q - c).$$

We shall endeavor to follow and record the progress of this controversy. It will be recollected that we long since here expressed the judgment that, whatever might be the ultimate verdict: "a merit that will doubtless be widely conceded to Mr. Farmer and Prof. Silliman in this case is in having awakened the attention of photometricians and gas-chemists to the glaring unreliability and inaccuracy of the rule in undisputed acceptation hitherto," etc. The usual arrogance of British towards American Scientists is displayed in this matter by refusing even to recognize this. Mr Heisch, Gas Examiner to the City of London, in a communication to the Association of Gas Managers, goes so far as to speak of "some very gross errors in principle, which one would hope were the printer's rather than the professor's."

The spirit is still abroad that in the time of Franklin is stated to have led a Committee of the Royal Society, to gratify their own spleen and that of Georgius Tertius, to recommend the attachment to the powder magazines of lightning rods terminated by knobs! H. W.

American Chemical News.

FARMER'S THEOREM DISCUSSED.

By Fred. E. Stimpson.

[From the Am. Journal of Science and Arts, Vol. 50., Nov., 1870.]

From advance sheets forwarded to the Editor by Mr. Stimpson, Official Gas Inspector of the State of Massachusetts.

Toward the close of Prof. Silliman's paper, "On the relation between the intensity of light produced from the combustion of illuminating gas and the volume of gas consumed" (Am. Jour., xlix, 17, this Repertory), is the following:

"A comparison of the foregoing results will show that the coincidences, with the requirements of the theorem of Farmer are, within the limits assigned, too numerous, and too closely accordant, to be considered as otherwise than pointing clearly to its general truth."

What I propose to examine now is, whether the data given in the paper referred to, do warrant the conclusion reached.

According to the data given for the first experiment, two lights were made equal, so that the disk of a Bunsen Photometer stood midway between the flames, and the consumptions were found to be 3·66 feet per hour.

"The screen was then moved upon the bar to a point just four times as far from one flame as it was from the other, i. e., the bar being 100 inches, the screen stood at 80, i. e., as 1 : 4. The light from the distant burner was then increased, until the disk showed as an equality of illumination. On reading the rate of the gas consumed by the two burners respectively, one gave 3.66 cubic feet and the other 7.32 cubic feet."

Now from this it will be seen that the ratio of consumption was as 1to 2, but the ratio of the lights being as the squares of the distances from the disk, becomes $200^2 : 80^2$ or 1 : 16, and the result on the paper should stand,

$$3.66^4 : 7.32^4 — 1 : 16 \text{ and not}$$
$$3·66^2 : 7.32^2 — 1 : 4.$$

In other words, the llghts were proportional to the fourth powers of the consumptions and not to the squares.*

In experiments 2, 3 and 4, the ratio of the squares of consumption is nearer to the ratio of the lights than the simple ratio of the consumptions, but in experiment 2, the ratio of the 2.67 powers of the consumption almost exactly expresses the ratio of the lights. In experiment 3 the ratio of the squares is too small, and in experiment 4 it is too great; while in experiment 5, the simple ratio is certainly much nearer than the ratio of the squares.

The following table will, I think, suffice to show these various relations:

No. Expt.	Rate of consumption per hour.	Intensity found by experiment.	Intensity by old law	Intensity by law of the squares.	Intensity by the 2·67 power of consumption.	Difference between calculated and observed results. Old law.	Difference between calculated and observed results. Law of squares.	Difference between calculated and observed results. 2·67 power.
2	3·30	1·	1·	1·	1·	0	0	0
	4·35	2·1	1·32	1·73	2·098	—0·78	—0·37	—0·002
	5·136	3·2	1·65	2·42	3·222	—1·65	—0·78	+0·022
	5·656	4·0	1·68	2·83	3·995	—2·32	—1·17	—0·005
3	3·72	1·	1·	1·	....	0	0	....
	4·884	2·	1·312	1·72	....	—0·628	—0·28	....
	6·000	3·	1·61	2·60	....	—1·39	—0·40	....
	7·218	4·	1·94	3·76	....	—2·06	—0·24	....
4	4·5	1·	1·	1·	....	0	0	....
	9·519	4·	2·114	4·46	....	—1·886	+0·46	....
5	5·16	1·85	1·85	1·85	....	0	0	....
	10·06	4·00	3·70	5·72	....	—0·30	+1·72	....

In experiment 6, the reductions have been made by applying the old rule to the correction for the candle in both cases; the correction by Farmer's Theorem being applied only to the consumption of the gas, and so applied gives the most concordant results, the difference shown by the old rule however, (1.34 candles) is no greater than might have occurred between two observations, even if the consumption in both cases had been equal, i. e., five feet per hour. But this experiment alone certainly does not warrant the conclusion reached, viz:—"That this theorem applies with equal force to the weight of sperm consumed by the standard candle as to the volume of the gas burned in equal times," because the correction has *not* been applied to the candle either here or in any other observation given in Prof. Silliman's paper.

The confirmation obtained by experimenting upon Peytona, Albert and Wollongong gases depends upon the assumption that the true candle power of a rich gas can be obtained by mixing it in definite proportions, with another gas whose illuminating power is known, and deducing from the observed candle power of the mixture, the candle power of the rich gas; until this assumption has been proved to be correct, it is of course useless in establishing Farmer's Theorem.

The next proof offered is drawn from a tabular statement in Sugg's Gas Manipulation Prof. Silliman says, "By this statement the burner in question produced from five cubic feet of gas exactly 15 (14 ¶) candle power, but when reduced to 4.5 cubic feet consumption the candle when 'corrected to the standard quality of gas by proportion' was only 11.93 candles. The values of the 'correction' referred to can only be conjectured, but assuming that the observation made the uncorrected rendering 11.32 candles (a very probable quantity), we find that the law of the squares of consumption then makes the ratio as follows:—$4.5^2 : 11\ 32 —5^2 : 14$." The assumption here made is not at all necessary because we can find the exact value of the 'correction' for the gas by reversing the proportion used, thus:—5 : 11.93—4.5 : 10 73, and now applying Farmer's Theorem the ratio becomes $4.5^2 : 10.73—5^2 : 13.24$ only. The relation can be expressed by the ratio $4.5^{\frac{1}{2}} : 10.73—5^{\frac{1}{2}} : 13.997—14$.

The last proof offered is drawn from Audoin and Berard's experiments. But after several fruitless efforts to obtain the results, as given under the head of "Intensities by law of the squares of consumption," I am forced to conclude that these figures are incorrect through some inaccuracy in applying that law. The two tables referred to may be found in the author's original memoir on pages 439 and 441 of Annales de Physique et de Chimie, vol. lxv, 1862. In these experiments they compared the burning of two batwing burners at different rates of consumption, with a Bengel Argand" whose rate of consumption was nearly constant. The first three columns of the table below give their experimental data.

Table I.—*Burner of the Fifth Series—dii 1-83 inch wide.*

Consumption of the Batwing under trial	Consumption of the Bengel Argand.	Comparative intensities. The Bengel burner being 100.	Intensities by old formula or direct ratio of consumption.	Difference between calculated and observed results.	Intensities for law of the squares of consumption.	Difference between calculated and observed results.
Liters per hour.	Liters per hour.		I'		I''	
211	100	120	99·38	—0 62	82·31	— 17·69
189	96	110	97·64	—2·36	86·38	— 13·62
180	103	100	100·00	0·00	100·00	0.0
156	104	90	104·85	+4·85	122·17	+22·17
142	104	80	102·89	+2·89	131·06	+31·06
124	101	70	99·65	—0·35	141·84	+41·84
102	101	60	103·82	+3·82	179·68	+79·68
88	102	50	99·30	—0·70	197·19	+97·19
68	100	40	102·79	+2·79	264·20	+164·20
57	102	30	90·73	—9·27	293.40	+193·40

From the first table it will be seen that the two burners gave equal light (intensity 100), when the batwing consumed 180 liters per hour, and the standard

103 liters. Correcting the first line of this table for these consumptions, by the old rule we have for batwing $211 : 180—120 : l$
and for the standard $103 : 100— \quad l : l'$;
the total correction for both will be $211 \times 103 : 180 \times 100—120 \times l : l \times l'$;
the l cancels out and leaves the proportion $211 \times 103 : 180 \times 100—120 : l'$.
The second line of this table becomes $189 \times 103 : 180 \times 96—110 : l$
and so on.

TABLE II.—*Burner of the same series—slit 1·63 inch wide.*

Consumption of the Batwing under trial	Consumption of the Bengel Argand. Liters per hour.	Comparative intensities. The Bengel burner being 100.	Intensities by old formula or direct ratio of consumption.	Difference between calculated and observed results.	Intensities for law of the squares of consumption.	Difference between calculated and observed results.
264	106	200	100·4	+ 0·4	50·3	49·7
236	105	180	100·1	+ 0·1	55·6	44·4
208	105	160	100·9	+ 0·9	63·5	36·5
182	105	140	100·9	+ 0·9	72·8	27·2
152	104	120	102·6	+ 2·6	87·7	12·3
130	104	100	100·0	0·0	100 0	0·0
112	104	80	92·8	— 7·2	107·8	7·8
90	104	60	86·6	—13·4	125·1	25·1
75	104	50	86·6	—13·4	150 2	50·9
66	104	40	77·8	—22·2	155·2	55·2
43	104	20	60·5	—39·5	182·8	82·8
28	104	10	46·4	—53·6	215·5	115·5

Now applying Farmer's Theorem, the proportions become.

$$(211)^2 \times (103)^2 : (180)^2 \times (100)^2 —120 : l''$$
$$(189)^2 \times (103)^2 : (160)^2 \times (96)^2 —110 : l''.$$

The value of l' and l'' from these proportions will be found in the 4th and 6th columns of the above table.

It will be seen that in the second table the burners gave equal light for consumptions of 130 and 104; these numbers have been used therefore in the corrections for that table.

The experiments show that the last term of the proportions should be 100. The tables show that by the old formula, this term becomes about 100 for every experiment of the first table, and for the first seven experiments of the second table, the greatest difference being 7.2; and for the remaining five experiments, the old formula gives the best approximate results except for the last one, and here the old law gives a result which must be *multiplied* by 2.15 to make it correct, and Farmer's Theorem gives a result that must be *divided* by 2.15 to make it correct.

From a perusal of these various results, I am led to disagree with Prof. Silliman, and say that 'Farmer's Theorem' is not proven, and that the law of the squares does *not in general* give any closer results than the old law of the direct ratio; though I entirely and heartily concur with him in the conclusion, *that every photometric observer should recognize the importance of bringing the consumption of gas and sperm to the agreed standard*, when attempting to give the true candle power of any gas.

It is much desired that experimenters should turn their attention to the matter of the relation of consumption of gas to illuminating power, and I sincerely hope that Mr. Farmer will not let the matter rest here, but will make and publish further observations upon the same subject.

Messrs Audoin and Berard in their valuable experiments, to determine the best burner for the city of Paris, proved that for every consumption of gas there is a burner which is best suited for that consumption Now by the proper selection of a burner for small consumptions, some simple relation may yet be found between consumption and illuminating power.

In the above, reference has been made only to experiments detailed in Prof. Silliman's communication. I have, however, made a number of experiments myself upon the same subject, besides collating the results of some sixty or more independent observations, which have been published during the last fifteen years, and the results are curious, instructive and unexpected. There are a few among them to which the old law will apply; though many of them require a *modification* of the old law.

I hope in due time to prepare a paper giving some of the results.

N. Y. LYCEUM OF NATURAL HISTORY, Nov. 14.

Our Report of the meeting of the Chemical Section of this Institution, together with the whole of our REPERTORY head, was crowded out of the last issue, and into this one we shall get but an apology for a Report.

DR. WALZ was not present, but Professor SEELY took his place, with an explanation of his views regarding the recent wonderful discovery of ANDREWS, in experiments on liquefied carbonic acid, but applicable to volatile substances generally; of a critical point of temperature for each substance, under sufficient pressure, at which its vapor occupies appreciably the same volume as the liquid, and at which there exists an intermediate condition between liquid and gaseous, and where small increase of temperature converts wholly into gas or vapor, and small decrease into liquid, without appreciable change of volume. Prof. SEELY thought that the new fact could have been predicted from already known facts; namely from the observation of REGNAULT that the latent heat of steam decreases about three degrees for each ten degrees centigrade of rise, so that he calculated that at about 1700° C. we should have, in the case of water, a point, at which steam has no latent heat, and behaves merely like a gas. This he considered to be the critical point.

Prof. HYATT recalled in this connection, the old experiments of CAGNIARD DE LA TOUR, who deduced from his results that the point at which water, as he supposed, remained liquid under sufficient pressure, was as low as a red heat, therefore much lower than Prof. SEELY's calculation.

Prof. H. WURTZ remarked that in the Sept. and Oct. No. of the *Bulletin de la Societe Chimique*, recently received, one of the Editors M. SALET, points out that DRION, in the cases of chloride of ethyle at 170°, and sulphurous acid about 140°, had already, ten years before, indicated precisely similar phenomena to those supposed by ANDREWS to be entirely new (*Annales de Chim. Phys.* 3, *lvi*,). This does not, however, detract from the fame of ANDREWS's discovery, no doubt made without knowledge thereof.

Prof. H. WURTZ explained a portion of his new observations and views regarding the Lithology and Chemical Geology of the Hudson River Palisades and the range of so called "sandstones" and traps to which they belong; and the subfect was received with so much interest that the author was invited by special resolution, at the suggestion of the President, Prof. NEWBERRY, to continue the same topic on the succeeding Monday evening, the 21st, the meeting of the Geological Section, that evening being set apart for the purpose. This was accordingly done, and Prof W. also introduced on this latter occasion the announcement of some new methods in Lithological Densimetry. These communications may possibly be presented, in brief, hereafter.—H. W.

Photometry as Applied to the Estimation of the Value of Coal Gas.

By Messrs. T. N. KIRKHAM, C. E., and W. SUGG, A. I. C. E.

[The following lecture was delivered at the meeting of the British Association of Gas Managers, held recently.]

[Continued from page 147.]

According to the first and and only official system of gas examination for illuminating power, which is that described in the instructions issued by the gas referees appointed under the City of London Gas Act of 1868, the time at which the tests for illuminating power are to be made fall within those hours during which the gas is likely to be most extensively consumed—from five to eight o'clock P. M. in winter, and from eight to ten in summer.

The average of a number of tests is to be taken.

The apparatus is to be construct d upon an improved model, and fixed in an approved manner, similarly to that set up in the office of the gas referees, and which is to be taken as a guide, and the entire apparatus when in use is subject to occasional visits of inspection by these officers.

It consists of a photometer, either on the Evans or the Letheby system, arranged for two candles. A meter with combination index, by which both the time and the consumption of the gas are simultaneously indicated on the same dial. A delicate balance governor. A King's pressure-gauge, showing the 100th of an inch, and fitted with an arrangement by which the pressure on the inlet and outlet of meter, outlet of governor, and at the point of ignition can be readily ascertained. A standard burner, known as the "London" burner, No. 1 size, and fitted to take either a 6, 7, or 8-inch chimney. A delicate candle-balance capable of weighing to the tenth of a grain. A cubic foot measure, for the purpose of verifying the accuracy of the meter from time to time.

As the *modus operandi* as described by the gas referees is very short, it will be best to take it from their printed instructions.

Mode and Time of Testing for Illuminatng Power.

Until the end of September next, the testings for illuminating power shall be three in number, and shall commence at the following hours:

For Common Gas.		*For Cannel Gas.*	
1st Testing at	8 P. M.	1st Testing at	8.30 P.M.
2d "	" 9 "	2d "	" 9.30 "
3rd "	" 10 "	3rd "	" 10.30 "

"The photometers to be used in the testing-stations shall, until further order, be the improved forms of the Bunsen photometer, which have been certified by the referees. The burner to be used for testing the common gas of the Gas-light and Coke Company, the City of London Gas Company, and the Great Central Gas Company (which is required to have an illuminating power of 16 candles) shall be Sugg's "London" Argand No. 1, with a 6 inch by 2 inch chimney; and for the gas of the Imperial Gas Company and the South Metropolitan Gas Company (which is required to have an illuminating power of 14 candles) Sugg's "London" Argand No. 1, with a 6-inch by 1¾-inch chimney. If at any time the gas-flame tails over the top of the glass, a 7-inch by 2 inch chimney shall be used for the 16-candle gas, and a 6 inch by 2-inch chimney for the 14-candle gas. The chimneys must be cleaned daily, at the commencement of the testings. The burner to be used in testing cannel gas shall be Sugg's steatite bat's-wing No. 7. The candles shall be sperm, and two candles shall be used together. The gas in the photometer is to be lighted at least ten minutes before the testings begin, and shall be kept continuously burning from the beginning to the end of the tests.

"Each testing shall include ten observations of the photometer, made at intervals of one minute. The gas is to be consumed at the rate of five cubic feet per hour. The standard rate of consumption for the candle shall be 120 grains per hour. Before and after making each set of ten observations of the photometer, the gas examiner shall weigh the candles and if the rate of combustion shall have been more or less per candle than 120 grains per hour, he shall make (and record in a book to be kept for the purpose) the calculations requisite to neutralize the effects of this difference."

These calculations are made by simple proportion as usual. The gas examiners are, at least once a week, to test the meter-clocks, by the standard clock in each testing station, and corrections are also to be made for temperature and barometric pressure, according to tables provided by the gas referees. The average of each set of ten observations is to be taken as representing the illuminating power of the gas for the day.

Besides this the gas referees have taken a vast amount of trouble, and have made a very great number of experiments, with a view of obtaining sperm candles of uniform quality, capable of consuming the standard quantity of 120 grains with average regularity, and they supply to each gas examiner the candles which he shall use in his tests.

These instruments leave nothing to be desired either in the reliability of the apparatus or the correctness of the mode of procedure, and, indeed, afford an example of the most perfect system of testing which can be adopted in connection with the present parliamentary standard.

But in order that the system of testing for illuminating power shall be conclusive as a scientific test, it is still desirable that they should carry their investigation further. The important question still remains unresolved—What is a sperm candle?

What is a sperm candle? And what is the just amount of light which ought to be obtained from the combustion of 120 grains of sperm per hour consumed by one of these candles? *Quis custodiet ipsos custodes?* By what standard shall we measure the standard?

It is here proper to mention that the parliamentary rate of consumption of sperm candles of six to the pound appears to be abnormal, for in the report of Messrs. Graham, Cooper, Brande, and Loeson, given in the Great Central arbitration case, page 223, we find the average consumption ranges from 130 to 135 grains. The parliamentary rate, therefore, must have been arbitrarily assumed.

Now we shall proceed to show you how we set about answering this question, by referring you to a set of diagrams, showing the results of a number of experiments made by my colleague and myself for this purpose. In the first place, we must tell you that to do this properly it was necessary to devise a special instrument. That instrument is before you, and it is called the "cross" photometer. It is, as you will see, a combination of the two most approved comparison

photometers in general use, viz., that devised by Mr. F. J. Evans, the engineer-in-chief to the Chartered Gas-light Company; and that devised by Dr. Letheby, the chief gas examiner for London. Two of the arms of the cross are Evans photometers; the other two are Letheby photometers. It is so contrived that all the four instruments can be used simultaneously and independently to determine the illuminating power of the gas consumed by one burner fixed in the centre of the instruments, and equidistant from the candles, or other standards of comparison, placed at the end of each photometer. Each photometer is provided with plumb-lines, so that the flames of the candles, or other standards used, can be accurately placed at their proper distances. The diagram exhibits the cross photometer as it was arranged for making comparisons between the English and French systems, and it will be seen that for the purpose of of this series of experiments two of the arms were supplied with French lamps, burning colza oil, and the other two with standard sperm candles. The instrument as it is now before you is arranged for candles at each photometer. The four photometers give each precisely the same results if tested by means of jets of gas of equal illuminating power fixed in the places usually occupied by the standard candles.

It will be seen also that a clock-meter, King's pressure-gauge, and a delicate balance governor are attached to the instrument, for adjusting and maintaining the quantity of gas to be consumed by the testing-burner. Each photometer is also provided with a minute-clock and a balance, for ascertaining the consumption of each pair of candles during the course of the experiments. Four operaters can, therefore at the same time test the same gas. For the experiments we are about to point out to you, the *modus operandi* was as follows:

Each photometer is distinguished from the others by a separate mark, and all experiments performed at that particular instrument are shown on the diagram by that mark.*

At the conclusion of every experiment each operator marked the result on a prepared diagram, ruled in the same manner as these. The explanation of the ruling of the diagrams is as follows:

The base line and the longitudinal lines ascending from it represent the weight of material consumed—one line to every grain, ranging from 118 grains up to 160 in diagram No. 1.

The lateral lines show the illuminating power, and correspond to the divisions on the photometer-bar, ranging in diagram 1 from 12 to 17 candles.

The strong black on all the diagrams encloses all those experiments in which the candles consumed within the limits of what are considered good experiments, viz., from 118 to 130 grains per hour.

Diagram 1, plate 19.—Commencing with experiments Nos. 56 and 58, in No. 56, with a consumption of 119 grains, the illuminating power of the standard gas is represented as 15·3 candles; whilst in No. 58, with a consumption of of 121 grains, it is 14·5 candles. The difference between these two experiments, made with candles which happen to be nearly within the parliamentary standarn, is ·8 of a candle. In experiment No. 51, burning the normal standard quality of 135 grains, the same gas is represented as being 15·48 candles; and in No. 61, consuming 134·4 grains or ·6 of a grain less, it is shown to be 16·28 candles, the difference being in this case also ·8 of a candle. In experiment No. 60, with a consumption of 134·7 grains, or only ·3 of a grain more, the gas was shown to be equal to 18·18 candles, a difference of 2·70 candles. Thus candles, practically burning the same amount of sperm per hour, show a difference in the illuminating power of the gas of 2·70 candles. In experiment No. 51, with a consumption of 129 grains of sperm, the gas is shown by the reading of the photometer, to have an illuminating power of 12·6 candles. In experiment No. 52, with a consumption of 145·2 grains, the gas appears, from the reading of the photometer, also to be equal to 12·6 candles. Experiment No. 52, with a consumption of 157·2 grains, shows the gas to be equal to 12·54 candles, by the reading of the photometer. The last three experiments were examples of candles consuming different quantities of sperm, yet giving the same amount of light, the correction of which to the parliamentary standard of 120 grains creates error. Experiments Nos. 57 and 54, each with the same consumption of 130·2 grains, show the difference in the illuminating power of the gas to be 2·42 candles; the former representing it as 13·02, and the latter as 15·44 candles, by the readings of the photometer. These are examples of candles burning the same quantity of sperm, yet giving a different amount of light. The greatest difference in the illuminating power of the "standard gas" shown throughout the 44 experiments made upon this day was 4·60 candles; being between experiment No. 51, with a consumption of 129 grains, giving an illuminating power of 13·58 candles, and experiment No. 60, consuming 134·7 grs., representing the gas to be 18·18 candles.

[To be continued.]

* We regret that we are unable to reproduce these diagrams. With attention in reading, however, a good idea of the results may be gathered without them.—H. W.

The Chemical History of a Candle.

BY PROFESSOR FARADAY.

[A course of Six Lectures delivered before the Royal Institution of Great Britain.]

LECTURE V.

Oxygen Present in the Air—Nature of the Atmosphere—Its Properties—Other Products from the Candle—Carbolic Acid—Its Properties.

We have now seen that we can produce hydrogen and oxygen from the water that we obtained from the candle. Hydrogen, you know, comes from the candle, and oxygen, you believe, comes from the air. But then you have a right to ask me, "How is it that the air and the oxygen do not equally well burn the candle?" If you remember what happened when I put a jar of oxygen over a piece of candle you recollect there was a very different kind of combustion to that which took place in the air. Now why is this?—it is a very important question, and one I shall endeavor to make you understand; it relates most intimately to the nature of the atmosphere, and is most important to us.

We have several tests of oxygen besides the mere burning of bodies; you have seen a candle burnt in oxygen, or in the air; you have seen phosphorus burnt in the air, or in oxygen, and you have seen iron filings burnt in oxygen. But we have other tests besides these, and I am about to refer to one or two of them for the purpose of carrying your conviction and your experience further. Here you have a vessel of oxygen. I will show its presence to you. If I take a little spark and put it into that oxygen, you know by the experience you gained the last time we met, what will happen—if I put that spark into the jar, it will tell you whether we have oxygen here or not. Yes! We have proved it by combustion; and now, here is another test for oxygen, which is a very curious and useful one. I have here two jars full of gas, with a plate between them to prevent their mixing; I take the plate away, and the gases are creeping one into the other. "What happens?" say you, "they together produce no such combustion as was seen in the case of the candle." But see how the presence of oxygen is told by its association with this other substance. What a beautiful curious gas I have obtained in this way, showing me the presence of the oxygen! In the same way we can try this experiment by mixing common air with this test gas. Here is a jar containing air—such air as the candle would burn in—and here is a jar or bottle containing the test gas. I let them come together over water, and you see the result; the contents of the test bottle are flowing into the jar of air, and you see I obtain exactly the same kind of action as before, and that shows me that there is oxygen in the air, the very same substance that has been already obtained by us from the water produced by the candle. But then, beyond that, how is it that air does not burn the candle as well as oxygen will? We will come to that now. I have here two jars; they are filled to the same height with gas, and the appearance to the eye is alike in both, and I really do not know at present which of these jars contains oxygen and which contains air, although I know they have previously been filled with these gases. But here is our test gas, and I am going to work with the two jars, in order to examine whether there is any difference between them in the quality of reddening this gas. I am now going to turn this test of gas out into one of the jars, and observe what happens:—There it is reddening, you see; there is then oxygen present. We will now test the other jar, but you see this is not so bright, not so red, not so distinct, as the first; and, further, this curious thing happens, if I take these two gases and shake them together well with water, we shall absorb the red gas; and then if I put in more, of this test gas, and shake again, we shall absorb more, and I can go on as long as there be any oxygen present to produce that effect. If I let in air, it will not matter, but the moment I introduce water, the red gas dissapears, and I may go on in this way putting in more and more of the test gas, until I come to something left behind which will not redden by the use of that particular body that rendered the air and the oxygen red. Why is that? You see in a moment it is because there is, besides oxygen, something else present which is left behind. I will let a little more air into the jar, and if it turns red, you will know that some of that reddening gas is still present, and that, consequently, it was not for the want of this producing body that that air was left behind.

Now, you will begin to understand what I have got to say. You saw that when I burnt phosphorus in a jar, as the smoke produced by the phosphorus and the oxygen of the air condensed, it left a good deal of gas unburnt, just as this red gas left something untouched—there was, in fact, this gas left behind which the phosphorus cannot touch, which the reddening gas cannot touch, and this is something which is not oxygen, and yet is part of the atmosphere

So that is one way of opening out air into the two things of which it is composed—oxygen, which burns our candles, our phosphorus, or anything else, and this other substance, which will not burn them. This other part of the air is by far the larger part. Now, this substance is a very curious thing when we come to examine it; it is remarkably curious, and yet you say, perhaps, that it is very uninteresting. It is uninteresting in some respects, because of this—that it shows no bright appearance of combustion. If I test it with a taper, as I do oxygen and hydrogen, it does not burn like hydrogen, nor does it make the taper burn, like oxygen. Try it in any way I will, it does neither the one thing or the other; it puts out the combustion of anything. There is nothing that will burn in it in common circumstances. It does not smell; it is not sour; it does not dissolve in water; it is neither an acid or alkali; it is as indifferent to all our organs as it is possible for a thing to be. And you might say, "It is nothing; it is not worth chemical attention; what does it do in the air?" Ah! then come our beautiful and fine results shown us by an observant philosophy. Suppose, in place of having nitrogen, or nitrogen and oxygen, we had pure oxygen as our atmosphere. What would become of us! You know very well that a piece of iron lit in a jar of oxygen goes on burning to the end. When you see a fire in an iron grate, imagine where the grate would go to if the whole of the atmosphere were oxygen. The grate would burn up more powerfully than the coals; for the iron of the grate itself is even more combustible than the coals which we burn in it. A fire put into the middle of a locomotive would be a fire in a magazine of fuel, if the atmosphere were oxygen. The nitrogen lowers it down and makes it moderate and useful for us, and then with all that it takes away with it the fumes that you have seen produced from the candle, disperses them throughout the whole of the atmosphere, and carries them away to places where they are wanted to perform a great and glorious purpose of good to man, for the sustenance of vegetation, and thus does a most wondeful work, although you say, on examining it, "Why, it is a perfectly indifferent thing." This nitrogen, in its ordinary state, is an inactive element; no action short of the most intense electric force, and then in the most infinitely small degree, can cause the nitrogen to combine directly with the other element of the atmosphere, or with other things round about it; it is a perfectly indifferent, and therefore to say, a safe substance.

But before I take you to that result, I must tell you about the atmosphere itself; I have written on this diagram the composition of one hundred parts of atmospheric air:

	Bulk	Weight
Oxygen.	20	22.3
Nitrogen.	80	77.7
	100	100.0

It is a true analysis of the atmosphere, so far as regards the quantity of oxygen and the quantity of nitrogen present. By our analysis, we find that 5 pints of the atmosphere contain only 1 pint of oxygen, and 5 pints or four parts of nitrogen by bulk. That is our analysis of the atmosphere. It requires all that quantity of nitrogen to reduce the oxygen down, so as to be able to supply the candle properly with fuel, so as to supply us with an atmosphere which our lungs can healthily and safely breathe; for it is just as important to make the oxygen right for us to breathe, as to make the atmosphere right for the burning of the fire and the candle.

But now for this atmosphere. First of all, let me tell you the weight of these gases. A pint of nitrogen weighs 10 4-10 grains, or a cubic foot weighs 1 1-6 oz. That is the weight of the nitrogen. The oxygen is heavier; a pint of it weighs 11 9-10 grains, and a cubic oot weighs 1¼ oz. A pint of air weighs about 10 7-10 grains, and a cubic foot 1 1-5 oz.

You have asked me several times, and I am very glad you have, "How do you weigh gases?" I will show you: it is very simple, and easily done. Here is a balance and here is a copper bottle made as light as we can, consistent with due strength, turned very nicely in the lathe, and made perfectly air-tight, with a stopcock which we can open and shut, which at present is open, and, therefore, allows the bottle to be full of air. I have here a nicely adjusted balance in which I think the bottle, in its present condition, will be balanced by the weight on the other side. And here

is a pump by which we can force the air into this bottle, and with it we will force in a certain number of volumes of air as measured by the pump. [Twenty measures were pumped in.] We will shut that in and put in the balance. See how it sinks; it is much heavier than it was. By what? By the air that we have forced into it by the pump. There is not a greater *bulk* of air, but there is the same bulk of *heavier* air, because we have forced in air upon it And that you may have a fair notion in your mind as to how much this air is, here is a jar full of water. We will open that copper vessel into this jar, and let the air return to its former state. All I have to do now is to screw them tightly together, and to turn the taps, when there, you see, is the bulk of the twenty pumps of air which I forced into the bottle; and to make sure that we have been quite correct in what we have been doing, we will take the bottle again to the balance, and if it is now counterpoised by the original weight, we shall be quite sure we have made our experiment correctly. It is balanced; so, you see, we can find out the weight of the extra volumes of air forced in in that way, and by that means we are able to ascertain that a cubic foot of air weighs 1 1-15 oz. But that small experiment will by no means convey to your mind the whole literal truth of this matter. It is wonderful how it accumulates when you come to larger volumes. The bulk of air [a cubic foot] weighs 1 1-10 oz. What do you think of the contents of that box above there which I have had made for the purpose? The air which is within that box weighs one pound—a full pound, and I have calculated the weight of the air in this room—you would hardly imagine it, but it is above a ton. So rapidly do the weights rise, and so important is the presence of the atmosphere, and of the oxygen, and the nitrogen in it, and the use it performs in conveying things to and fro, from place to place, and carrying bad vapors to places where they will do good instead of harm.

Having given you that little illustration, with respect to the weight of the air, let me show you certain consequences of it. You have a right to them, because you would not understand so much without it. Do you remember this kind of experiment: have you seen it? Suppose I take a pump somewhat similar to the one I had a little while ago to force air into the bottle, and suppose I place it in such a manner that by a certain arrangement I can apply my hand to it. My hand moves about in the air so easily that it seems to feel nothing, and I can hardly get velocity enough by any motion of my own in the atmosphere to make sure that there is much resistance to it. But when I put my hand here [on the air-pump receiver, which was afterwards exhausted], you see what happens. Why is my hand fastened to this place, and why am I able to pull this pump about? And see! how is it that I can hardly get my hand away? Why is this? It is the weight of the air—the weight of the air that is above. I have another experiment here which I think will explain to you more about it.

When air is pumped from underneath the bladder which is stretched over this glass, you will see the effect in another shape: the top is quite flat at present, but I will make a very little motion with the pump, and now look at it—see how it has gone down, see how it is bent in; you will see the bladder go in more and more until, at last, I expect it will be driven in and broken by the force of the atmosphere pressing upon it [the bladder, at last broke with a loud report]. Now, that was done entirely by the weight of the air pressing upon it and you can easily understand how that is. The particles that are piled up in the atmosphere stand upon each other, as these five cubes do; you can easily conceive that these five cubes are resting on the bottom one, and if I take that away, the others will sink down. So it is with the atmosphere; the air that is above is sustained by the air that is beneath, and when the air is pumped away from beneath them, the change occurs which you saw when I placed my hand on the air-pump, and which you saw in the case of the bladder, and which you shall see better here. I have tied over this jar a piece of sheet India-rubber, and I am now about to take away the air from the inside of the jar, and if you will watch the India-rubber, which acts as a partition between the air below and the air above, you will see when I pump how the pressure shows itself. See where it is going to; I can actually put my hand into the jar; and yet this result is only caused by the great and powerful action of the air above. How beautifully it shows this curious circumstance?

[To be concluded.]

The Causses of Spontaneous Ignition of Coal.

Many different theories have been put forth to explain the spontaneous ignition of coal, which happens so often, especially when coal is piled up in large masses. It has been attempted to attribute it to a decomposition of the coal similar to the decaying process of vegetable substances, like, for instance, that occurring with moist and tightly-packed hay—a decomposition which often produces combustible gases. Dr. E. Richters, chemist of the mining school at Waldenberg, however, declares such a decomposition highly improbable. Coal is the product of a slow process of transformation of the ligneous fibres, under entire or partial exclusion of air. It is impossible to understand how this alteration should at once be carried to spontaneous ignition, when the coal comes in contact with air; but it is certain and susceptible of proof that in this case there is a slow oxidation of exactly those constituents of the coal, which could not have been formed but under the exclusion of air. The formation of easily ignited gases, as a consequence of continual decomposition, does not take place in the air, neither at ordinary nor high temperature (about one hundred and ninety degrees Centigrade), whether the coal be dry or moist. The immediate cause of spontaneous ignition is also frequently attributed to iron pyrites, which is never entirely wanting in any coal. According to Richters, however, this influence is only of subordinate importance in most cases, because the coal richest in iron pyrites is by no means always most inclined to spontaneous combustion, and also because the amount of pyrites present is always too small to explain spontaneous combustion by its decomposition, even under the most favorable circumstances.

Let us suppose, for instance, that a certain kind of coal contains one per cent. of iron pyrites; if this should suddenly be decomposed under circumstances prohibiting all loss of heat, the temperature of the coal would be raised seventy-two degrees C. But the oxidation of iron pyrites never takes place under circumstances as favorable as those here assumed. It always requires a long time, and is frequently not ended after the coal has been exposed for years. Of course, the slower the process, the less is the increase of temperature, because, under otherwise similar circumstances, the loss of heat by conduction, radiation, evaporation, etc., is proportionated to the time. Richters attributes the spontaneous ignition of coal to another cause. All coals absorb oxygen, though with different intensity. This absorption is the first source of the generation of heat; but, like that caused by the oxidation of iron pyrites, it is not sufficient for combustion. But the remarkable and very important difference exists in this case, that the heat is developed in a much shorter time, and that it exerts therefore a more effective influence towards raising the temperature than when iron pyrites is oxidized in a proportionally long time. Richters found, for instance, that coarse coal-dust absorbed in twelve days from one and a quarter to three times its own volume of oxygen; and he assumes, according to an approximate calculation, that the temperature of the coal which took up the most oxygen, may have been about eighty-three degrees C. As soon as the temperature has been raised by absorption to a certain degree, a strong chemical reaction of the oxygen on the ignitable portion of the coal is inaugurated. This reaction is, on one hand, a new source of the development of heat, while, on the other hand, it is itself increased continually with the increasing temperature. According to Richters' experiments, three different kinds of coal lost, by a continual heating from seventy to eighty degrees C., during a fortnight, as high as 3.6 per cent. of their heating power. The same effect can be reached if the coal is heated during three or four days only to one hundred and five degrees; and the same alterations take place in a few hours, if the temperature is raised to one hundred and fifty degrees. For one of the coals experimented upon, for instance, the heat lost, during a fortnight's exposure to the above test, is calculated to be equal to two hundred and eighty-six units per pound of coal; if these had served only to heat the coal, its temperature would have been raised one thousand one hundred degrees, or, in other words, the coal would have been heated to far above its point of ignition, and consequently, would, have been burnt. Absorption must here be kept separate from oxidation proper; the first, as the nearest cause of the solution of heat, to a certain degree introduces the process; and only when the temperature is raised sufficiently, does oxidation of the coal take place with increasing rapidity, until ignition follows; all conditions, which favor the absorption and necessary supply of oxygen, but, act against a diffusion of heat, must consequently enhance the temperature, which will ultimately be increased to ignition. Of high importance in this connection are:

1. The attraction of oxygen by the surface of the coal. The greater this surface the more rapidly under, the same conditions, does the rise of the temperature take place. If the surface is very small, it is possible that the loss of heat, during a certain time, will equal the amount of heat set free, in which case the temperature will not be raised. The essential condition for a subsequent rapid oxidation is, therefore, in such a case, wanting.

2. Breaking coal into small pieces, which affects, indirectly, the absorption of oxygen, is next to be considered. Small pieces, offering a greater surface to the air, and hence absorbing oxygen faster, become more intensely heated than larger pieces. The structure of the coal is also of importance in this connection, since the more porous and fibrous varieties absorb oxygen faster than dense pieces of the same size.

3. When coal is not stored in large heaps, the heat generated is not radiated, and is not likely to raise the temperature to any great extent.

4. All conditions which tend to the replacement of the oxygen consumed are of inherent importance. In many districts it is common to leave canals of from three-quarters of a foot to one foot diameter, constructed of loosely-jointed plank, through the dumps. These canals can only serve to allow the heat to escape, by virtually dividing large dumps into smaller ones. But, on the other hand, owing to their usual imperfect construction they are decidedly injurious.

Every miner, who handles easily-ignited coal, knows that combustion first takes place where the dry coal is exposed to a draught of fresh air, which supplies the place of air, from which the oxygen has already been taken up.

These canals can only answer a good purpose when they are entirely air-tight, and pass through the dumps either from side to side, or from top to bottom. Whenever, on account of imperfect construction or improper arrangement, they allow a changing of the air in the centre of the dump, they positively increase the danger.

At all events, the spontaneous ignition of coal can be much better prevented by packing the dump as closely as possible, and entirely rejecting those canals, than by using them as they are now made.

Dampness may sometimes assist and sometimes hinder the ignition. When the coal contains much pyrites (which is only decomposed in the presence of water), and has, in other respects, but little absorptive tendency, it is quite possible that the heat generated by the oxidation of the pyrites, might be greater than that produced by the absorption of oxygen by the coal. Such a coal would decompose faster and would be more likely to ignite spontaneously, in a moist than in a dry condition.

If, on the contrary, the proportion of pyrites is small, and the absorptive tendency of the coal itself greater, spontaneous ignition would take place sooner, because the absorption of oxygen would be more considerable in a dry than in a wet state.—*Deutsche Industrie-Zeitung.*

The Fuel Question.

PROSPECTIVE SUPPLY AT LAWRENCE—THE DIFFERENT VARIETIES OF KANSAS COAL AND YIELD OF GAS.

The following informrtion regarding Kansas coal and its value as gas coal, we clip from the *Republican*, Lawrence, Kansas. The tests made by Mr. Farwell, Superintendent of the Lawrence Gas Works, showing the yield of gas per pound, will be interesting as showing the resources of our western people:

As the fuel question seems to be the most important one before this community just at present, we will give a few facts and figures which may prove interesting to those of our readers who may have this question to deal with pecuniarily.

From present appearances the supply of coal for this market is to be abundant, and of all grades and qualities, with corresponding prices. The best coal in the market for all purposes, and in fact the best coal west

of Pittsburgh, is the Fort Scott Black coal and the Wilson creek black coal. Then comes Osage county, Franklin county, Burlingame, Blue Mound, Douglass county and Carbondale, which constitute the grades that will be sold here for this winter's consumption.

The Fort Scott coal is of three varieties, the bright, glossy, jet black coal, the rusty coal, and the red coal (so called). These coals are obtained by the process called "stripping" which is throwing off the earth and rock from the coal, and then taking out the coal. Of course this plan can only be adopted where the deposits of coal lie near the surface of the earth, as is the case with the coal at Fort Scott. The best black coal underlies a deposit of three feet of earth and three feet of slate rock. The "rusty" coal lies at about the same depth, but has no rock above it, consequently the water obtains access to the seams and crevices of the coal and discolors it, hence its appellation of "rusty." This coal is equally as good for fuel purposes as the best black. The red coal lies nearer the surface, and is inferior in quality to the black or rusty. The other coals mentioned above are all mined coals, being obtained by drifting into the hills. Mr. Farwell, superintendent of the gas works, has made a thoroughly practical test of all these coals, with the following result, showing the relative value of each for gas generating purposes:

YIELD OF GAS PER POUND OF COAL.

Fort Scott black coal	4.5	cub. feet
Wilson creek coal	4.5	"
Osage county coal	3.0	"
Franklin county coal	2.6	"
Burlingame coal	2.5	"
Blue Mound coal	2.5	"
Douglas county coal	2.6	"
Carbondale coal	2.4	"

These lists are perfectly reliable, and are valuable as an item of record; and what is true in regard to the relative value of the coals for gas purposes, is equally true in regard to their relative value for fuel, as the correctness of these lists is fully corroborated by the engineers on our railroads, who use large quantities of coal. Their experience is, that the Fort Scott and Wilson creek coals do not "clinker" and clog the furnace, while all the others do, which is a very serious detriment to the successful making of steam.

The question is often asked, are we to have an uninterrupted supply of coal in Lawrence throughout the coming winter? We have been assured by Mr. Farwell, who is at present selling about two car-loads a day, that his arrangements are now perfected for a sure and uninterrupted supply of the very best Fort Scott black coal, and that he can supply all the other kinds at any time. He is also selling a superior quality of coke, which he claims to be the cheapest, most convenient, and most agreeable fuel for stores and residences.

Discovery of a Peat Bog in Montgomery County, Ohio.

A peat bog under the Drift has been discovered in Montgomery county, Ohio, one mile east of Germantown, and is described in *Silliman's Journal* of July last. It outcrops in the bed of Twin creek (a branch of the Miami), at a sharp bend, under cliffs of clay and gravel 50 to 100 feet high. The peat bed is 30 feet thick, lying on gravel. Its top layers contain undecomposed mosses (sphagnum), grasses and sedges. Its middle and bottom layers contain fragments of red cedar trees. At its southern end the bog shows a great accumulation of trunks, roots, branches, and twigs (with the bark on), so flattened by the pressure from above that two inch branches have become only ¼ inch thick, and smaller stems mere ribbons. Juniper berries abound in the top layers. Half a mile up stream trees two feet thick have been got out and used for posts. Nearly two miles east of the creek a well struck the bed at a depth of 30 feet and found it 10 to 15 feet thick. It is common to meet fossil wood in wells in this region. The wood is usually coniferous, but ash, hickory, and sycamore, grapevine, and beach leaves are reported. One or two feet of soil is often found under the yellow clay (lowest drift) stratum of the country, which is usually about 30 feet thick. Pebbles the size of a pea, but occasionally three or four inches in diameter, are scattered through the peat bed. The bed comes to an end down stream in a knife-edge resting against and on a lower bed of gravel, on a slope of 30 degrees, which represents the side slope of the ancient valley in which the peat bog grew. Under this edge of the peat bog are many limestone pebbles, white and soft as if they had been burned, but on analysis showing that their carbonic acid has not been driven off. The 30 deg. west-dipping floor includes heavy beds of ochreous gravel, which is washed for marketable paint. Small pockets of "blue earth" (vivianite, phosphate of iron) occur both in the under gravels and in the roof-clays, and a tooth was found in one of them, like but larger than a hog's tusk. Two mastodon tusks eight feet long were also found. The forest evidently grew on the spot at a date just before the last (Champlain) stage of the Drift Age. Stratified gravels under the bog show that the country *had been* previously under water, and the upper clays and gravels show that it was *afterwards* again put under water; but between the two submergences this part of Ohio was a forest-covered dry land, with swamps and peat bogs, as it is in some parts now, and in this forest roamed the mastodon, as it did again after the second submergence.

Correspondence.

[Correspondents in all cases should sign their communications with their names and address in full, not necessarily for publication, but as a guarantee of good faith.—EDS.]

For the Scrap Book—The Prevention of Boiler Scale.

SAN FRANCISCO GAS WORKS,
November 10, 1870.

Messrs. Editors: Does the experience of other readers confirm our own, that fresh water slightly charged with tar, naphthaline, and ammonia, does not form scale in a boiler?

Our immersed condenser has no tar shelf, and we use the waste water from it in the exhaust boiler, without being troubled with scale.

We have known this for some time; and I notice by one of the daily papers that the same fact has been observed at the Darmstadt Gas Works, in Germany.

GAS ENGINEERS' SCRAP BOOK.

CONDENSATION.—The greater the quantity of cold surface the gas is exposed to, the more complete is the condensation; *and a state of stillness materially aids the deposition of the tar.*—Matthew's Compendium of Gas-Lighting, London, 1827, p. 24, Very truly,

JAMES R. SMEDBERG.

[I would suggest that if the boiler-scale is, as usual, crystallized sulphate of lime (gypsum) the action of the ammonia and carbonate of ammonia condensed from the gas in preventing scale is very simple, as both these, particularly the latter, at once decompose the gypsum, forming highly soluble sal ammoniac and a sediment of carbonate of lime, which does not crystallize fast to the boiler-plate, like gypsum. The treatment of sea-water or other gypsiferous waters with *carbonate of baryta* or *carbonate of lead*, to remove the gypsum and prevent scale, as first devised and proposed by the present writer as early as 1852 (see *Chemical Gazette* for 1852, p. 268; LIEBIG and KOPP's *Jahresbericht der Chimie*, 1852, p. 360), was founded on this fact of the known constitution of boiler scale.—H. W.

'Synopsis of British Gas-Lighting."

The following additional subscribers to the above work is herewith acknowledged, making 243:

Peter Coffey, Sup't Belleville Gas Works, Ill.
P. E. Demill, Sec'y Gas Co., Detroit, Mich.
Samuel P. Mervine, Jr., No. 1538 Ogden street, Philadelphia, Pa.
Wm. C. Taber, Pres't New Bedford, Conn.
Coal Gas-Light Improvement Co., Boston, Mass.
H. B. Kirkland, P. O. Box 1140, N. Y. City.

Theory of the Bunsen Flame.—"The non-luminosity of the flame of the Bunsen gas burner is commonly ascribed to the more complete combustion of the gas by the air, which is mixed with it before it is burned. But this is an assumption entirely unproved as yet; and moreover, the positive experiments of Knapp show that this cannot be the only cause of the phenomenon. His burner was so constructed that by means of a lateral tube, other gases beside air could be mixed with the coal gas; and the results obtained prove that nitrogen, hydrochloric acid, or carbon dioxyd gas causes the flame to burn fully as blue as is seen in the burner as ordinarily used. Knapp believes that the disappearance of the luminosity is due partly to the cooling of the flame, but principally to the dilution of the illuminating gas; and that the flame of the Bunsen burner is non-luminous from the same cause which lessens the light of a candle burned in vacuo, or at high altitudes."

Advertising Index.

☞ In looking for advertisements, see figures 1 to 9, within brackets, at head of advertisement pages.

GAS-BURNERS, APPARATUS ETC

American Meter Co.—West 22nd st., N. Y., Arch and 22nd st. Phil., 23 West st. Boston 3
American Gas Screen Company, Haverhill, Mass..... 6
Cambridge Gas Stoves, Ranges, &c.—Gas Light Journal Offices, 8
Contractors for Gas-Works, Etc.—Murray & Baker, Fort Wayne, Ind..... 5
Gas Retorts, Etc.—George C. Hicks & Co., Baltimore, Md..... 8
Gas-Burners—C. Gefrorer, 529 Commerce street, Philadelphia, Pa..... 9
Gas Meter Manufacturers—Harris & Bro., 1117 Cherry street, Philadelphia, Pa..... 8
Gas Apparatus, &c.—Geo. H. Kitchen & Co., 561 Broadway.. 9
Gasometers, Etc—George Stacey & Co. Cincinnati, O..... 6
Gas Fixtures, Etc.—Mitchell, Vance & Co., 597 Broadway..... 4
Gasholders, Etc.—Deily & Fowler, 39 Laurel street, Philadelphia 6
Gas and Water Pipes—R. D. Wood & Co., Phil..... 9
Gas and Water Pipes—B. S. Benson & Son, Allentown, Pa.... 7
Gasometers, &c.—Keystone Iron Works—2132 Filbert st., Phil. 6
Jersey City Gas Meter Works, 14 Morris st., Jersey, N. J 5
Oil and Rosin Gas Works—John Butler, 126 Maiden Lane, New York..... 2
Patent Conically Slotted Wood Trays—John L. Cheesman, 147 and 149 Ave. C., N. Y 9
Patent Gas Exhauster—Smith & Sayre, 95 Liberty st..... 4
Wooden Gas and Water Pipe—J. S. Hobbie & Son, Elmira..... 9

GAS COALS

Despard Coal Co.—Parmlee & Bros. Agents, 32 Pine st. N. Y. 1
Gas Coals—Bird, Perkins & Job, 86 South street, New York..... 2
The Newburgh Orrel Coal Company—Chas. W. Hays, Agent in New York, Trinity Building, 111 B'way, Room 7..... 2

FOUNDRIES.

Atlantic Dock Iron Works—Hoy, Kennedy & Co., Office 98 Liberty street N. Y., P. O Box, 2848..... 5
Brooklyn Tube Works—B. T. Benton, Brooklyn..... 9
Columbian Iron Works—Wm. Taylor & Sons, 11, 13 and 15 Adams street, Brooklyn, N. Y..... 7
Cast Iron Pipes and Fittings—B. S. Benson, 52 East Monument street, Baltimore, Md..... 8
Continental Works—T. F. Rowland, Greenpoint..... 7
Camden Iron Works, Camden, N. J.—Jesse W. Starr & Sons... 7
Gloucester Iron Works, No. 8 North 2nd st., Phil—Sexton & Co. 7
Louisville Pipe Works—Dennis Long, Cor. 9th and Water-sts., Louisville, Ky..... 9
National Foundry and Pipe Works—Wm. Smith, Carroll, Pike, Smallman and Wilkins streets, Pittsburgh, Pa..... 7
Oregon Iron Foundry—Herring & Floyd, 738, 740, 742 and 744 Greenwich street New York..... 5
Pascal Iron Works—Morris, Taskar & Co., Philadelphia, Pa... 9
Providence Steam and Gas Pipe Co., Providence, R. I.—H. A. Branch Agent..... 6
Retorts, Pipes, &c.—R. D. Wood & Co., 400 Chestnut street, Philadelphia..... 3
Southwark Foundry—Merrick & Sons, Fifth and Washington treets, Philadelphia..... 9

WATER METERS, PUMPS, ETC.

Aubin Water Meter—H. Q. Hawley, Albany, N. Y..... 8
Cast Iron Pipes for Water and Gas—Riley A. Brick, 89 White street, N. Y..... 2
Steam Pumps—H. R. Worthington, 61 Beekman st. New York.. 7
Valves for Water, Steam and Gas—Ludlow Valve Man'g Co., 198 River street, Troy, N. Y..... 4
Water Pipes, etc.—S. Fulton & Co. 412 Walnut street, Phila..... 2
Water Closets, etc.—William S. Carr & Co. 106, 108, and 115 Centre street, New York..... 8
Worthington's Water Meters—H. R. Worthington, 61 Beekman street, New York..... 7

CLAY RETORT WORKS.

B. Kreisher, Clay Retorts, Etc., 58 Goerck street, New York.... 5
Brooklyn Clay Retort Works, Van Dyke st. Brooklyn, N. Y..... 5
Jersey City Fire Brick Works.—J. H. Gautier & Co., Greene, Essex and Bergen streets, Morris Canal Basin, N. J..... 4
Laclede Fire Brick Works, 1007 North Levee, St. Louis, Mo..... 5
Manhattan Clay Retort Works, 15th st. near Av. C, New York... 5
Philadelphia Fire Brick Works, Vine and 23d sts. Philadelphia.. 5
Clay Retorts, Fire Brick, Tiles, etc.—Wilson & Gardner, Lockport, Westmoreland County, Pa..... 7

LAMPS, STOVES, PETROLEUM, ETC.

Branson's Patent Lamp Post—Editors Gas-Light Journal, No. 42 Pine street, N. Y..... 9
Patent Lamp Post—J. W. Graham, Chillicothe, Ohio, or M. L. Callender, Office of this Journal..... 4

MISCELLANEOUS.

Architect and General Gas Engineer—William Farmer, 42 Pine street, Room 18..... 2
Engineers and Brass Founders—John Bailey & Co., Albion Works, Salford, Lancashire, England..... 2
Enamel for Gas Retorts and Furnaces—Wm. H. Paulding, Office of this Journal..... 6
Enamelers etc.,—J. H. Robinson & Co., 347 Grafton st, Liverpool..... 8
Humphrey's Combined Drill, Reamer and Tap..... 6
Mason and Builder—P. H. Spelman, 282 3d Avenue, N. Y..... 9
Professor Henry Wurts—Office Gas-Light Journal..... 2
School of Mines, Columbia College, East 49th st..... 7
Scientific and Chemical Expert—Prof H. Wurts, 26 Pine street, Room 36, N. Y..... 7
Screening Shovels—O. R. Butler, 126 Maiden Lane, N. Y..... 2
Synopsis of British Gas Lighting..... 1
Trinidad Bitumen—N. Y. and Trinidad Co., 21 Nassau st., N. Y. 5
Works Upon Gas—D. Van Nostrand, 23 Murray street and 27 Warren street, N. Y..... 5

WILLIAM FARMER,

Architect and General Gas Engineer,

42 PINE STREET, ROOM 18, N. Y.

WILLIAM FARMER may be consulted upon all matters connected with the construction of GAS WORKS, and other buildings. Will furnish General and Detail Drawings, Specifications and Estimates for Gas Works of any capacity, Retort Settings, Condensers, Washers, Exhausters, Purifiers, Holders, Coal Hoisting Apparatus, Iron Roofs, and every description of Machinery required in the Manufacturing of Gas.

PATENTEE OF THE FOLLOWING INVENTIONS:

Exhausters for Gas and Foul Lime Ventilation,
Dumping Barrows for Coal, Coke, and Lime,
Blowers for Forges,
Pumps for Water, &c., &c.

REFERENCES;

CHARLES ROOME, President Manhattan Gas-Light Company, N. Y.
SAMUEL DOWN, President American Meter Company, N. Y.
JOSEPH A. SABBATON, Engineer Manhattan Gas-Light Company, N. Y.
CHARLES MOWTON, Engineer New York Gas Light Company, N. Y.
SAMUEL P. PARHAM, Engineer Mutual Gas-Light Company, N. Y.
Prof. HENRY WURTZ, Editor Chemical Department GAS LIGHT JOURNAL
HENRY J. DAVISON, Engineer, 77 Liberty Street, N. Y.
HERRING & FOYD, Oregon Iron Foundry, 788 Greenwich Street, N. Y.
FREDERICK SABBATON, Engineer Troy Gas-Light Company, Troy, N. Y.
COL. WHITE, Engineer, People's Gas-Light Company, Williamsborgh, N. Y.
GEORGE W. PARSONS, Sup't and Eng'r, Rochester Gas-Light Co., Rochester, N. Y,
GEORGE W. EDGE, Eng'r, Jersey City Gas-Light Co., Jersey City, N. J.
J. H. GAUTIER & Co., Fire Brick Works, Jersey City, N. J.
Professor SILLIMAN, New Haven, Conn.
JOHN HARRISON, Engineer, People's Gas-Light Company, Baltimore, Md.
CHARLES FABEN, Sup't and Eng'r Toledo Gas-Light Co., Toledo, Ohio.
PETER F. BURTIS, Sup't and Engineer, Chicago Gas-Light Co., Chicago, Ill.
JAMES R. SMEDBERG, Consulting Eng'r, San Francisco Gas-Light Co., Cal.

R. D. WOOD & CO

MANUFACTURE

CAST IRON GAS AND WATER PIPES.

PHILADELPHIA.

On hand, several thousand feet 3, 4, and 6 inch Pipes, for immediate delivery. 226-6m

S. H. HENDERSON, Selling Agent,
No. 173 Broadway, New York.
SECOND FLOOR.

SABBATON'S PATENT
COKE AND COAL
SCREENING SHOVELS.

Made from best Mallable Iron.

FURNISHED WITH LONG OR D HANDLDS.

Perfect in their operation. Very strong and from their great durability vastly more economical than any substitute. Refer to all the principal Gas Companies of the country, who acknowledge them as the "ne plus ultra" of Coke Screening Shovels.

Orders addressed only to

O. R. BUTLER,
Sole Agent
No. 96 Maiden Lane, N. Y.

To Patentees and Manufacturers.

SUCH REQUIRING A FIRM TO INTRODUCE their Goods by means of Special Agents in Europe, will please quote lowest prices, and full particulars, to JOHN BAILEY, & CO. Engineers, Sundrymen and Brass Founders, Albion Works, Salford, Lancashire, England.

REFERENCE.—The Manchester Branch of the Liverpool and Manchester District Bank.

Good well tested novelties will receive attention.

Orders executed for all sorts of English Mechanical Goods, if accompanied with cash or a credit in England.

Five per cent. charged on amounts below £100.

Established thirty years. 247-tf

BIRD, PERKINS & JOB,

IMPORTERS OF

PICTOU,
SYDNEY,
LINGAN,
GLACE BAY,
CALEDONIA,
NEWCASTLE and
WESTMORELAND

C O A L,

ALSO,

INCE HALL HOUSE CANNEL.

3 INDIA WHARF, Boston. 86 SOUTH STREET, N. Y. [248

VALUABLE PATENT ON SALE,

FOR THE UNITED STATES.

Bailey's Patent Pyrometer

NOW BEING EXTENSIVELY MANUFACTURED in England by J. BAILEY & CO., Albion Works, Salford, Lancashire. The profits on the manufacture are *very* satisfactory. Apply to the Proprietors, or to

W. B. EDWARDS,
252-3t 358 State Street, New Haven, Conn.

THE NEWBURGH
ORREL COAL COMPANY,

Mines at Newburgh, Preston County, West Va.

Company's Office, No. 52 S. Gay street, Baltimore, Md.

C. OLIVER O'DONNELL, Pres't. G. W. MAHOOL, Sec'y.

CHAS. W. HAYS, Agent in New York, Room 7, Trinity Building, 111 Broadway.

SINCLAIR & AGNEW, Agents, Alexandria, Va.

This Company offer their very superior Gas Coal at lowest market prices.

It yields 10,996 cubic feet of gas to the ton of 2,240 lbs., of good illuminating power, and of remarkable purity; one bushel of lime purifying 6,792 cubic feet, with a large amount of coke of good quality.

It has been for many years very extensively used by various Gas Companies in the United States, and we beg to refer to the Manhattan, Metropolitan, and New York Gas Light Companies of New York; the Brooklyn and Citizens' Gas Light Companies of Brooklyn, N. Y.; the Baltimore Gas Light Company of Baltimore, Md., and Providence Gas Light Company, Providence, R. I

The best dry coals shipped, and the promptest attention given to orders. 224-1y

RILEY A. BRICK & CO.,

MANUFACTURERS OF

CAST IRON PIPES,

FOR WATER AND GAS,

ALSO,

GAS WORKS & MACHINERY CASTINGS

Of Every Description.

No. 89, White Street, New York.

RILEY A. BRICK. JAS. L. ROBERTSON.

THE DESPARD COAL COMPANY

OFFER THEIR SUPERIOR

DESPARD COAL

To Gas Light Companies throughout the country.

Agents, PARMELEE BROTHERS, No. 32 Pine street, N. Y.
BANGS & HORTON, No. 31 Duane street, Boston.

Mines in Harrison County, West Virginia.
Wharves, Locust Point, } Baltimore.
Company's Office, 29 South street, }

Among the consumers of Despard Coal, we name: Manhattan Gas Light Company, New York; Metropolitan Gas Light Company, New York; Jersey City Gas Light Company, N. J.; Washington Gas Light Company; Portland Gas Light Company, Maine.

*** Reference to them is requested. 204-1y

BUTLER'S

Patent Gas Works.

JOHN BUTLER, Sole Manufacturer,
126 MAIDEN LANE, NEW YORK.

OIL AND ROSIN GAS WORKS (all sizes) for Towns, Factories, Plantations, Churches, and Private Dwellings. These Works are warranted to make cheaper gas than any small Works known, and are very simple to manage. Refer to *over three hundred now in use from one to thirteen years*

Estimates furnished for cost of Works, and the cost of manufacturing Gas in various localities.

Send for descriptive pamphlet.

1-3m JOHN BUTLER, 126 Maiden Lane.

S. FULTON & CO.,

PLYMOUTH IRON WORKS,
Conshohocken, Pa.

Manufacturers of

PIG IRON & CAST IRON GAS & WATER PIPES.

Also, Heavy & Light Castings of every description.

412 Walnut street, Philadelphia, Pa.

SAMUEL FULTON, THEO. TREWENDT.

THE

AMERICAN GAS-LIGHT JOURNAL,

AND

Chemical Repertory.

Published on the 2d and 16th of Each Month

At No. 42 Pine Street, New York.

M. L. CALLENDER & CO.,

EDITORS AND PROPRIETORS.

This is a recognized official organ of—

LIGHT, HEAT MINING INTERESTS.
MECHANICS, WATER-SUPPLY, PATENTS,
VENTILATION, SANITARY IMPROVEMENT, AND
SCIENTIFIC SUBJECTS GENERALLY

TERMS.

SUBSCRIPTION—Three dollars per annum in advance.

AGENTS.

NEW YORK—AMERICAN NEWS COMPANY, 119 and 121 Nassau street.
BOSTON—S. M. PETTENGILL & Co., No. 6 State Street.
PHILADELPHIA—COE, WETHERILL & Co., Ledger Building, Phil'a
Germany.....B. WESTERMAN & Co., of New York.
Great Britain....TRUBNER & Co., 60 Paternoster Row, London
France.....LE JOURNAL DE L'ECLAIRAGE AU GAZ, 25 Boulevard Poissonnière
Brussels, Belgium—HENRI BERGE.

☞ All communications to be addressed to "The Editors, No. 42 Pine Street, Room 18, New York.

Consulting Chemist,
Geologist and General Scientist,
PROFESSOR HENRY WURTZ.

[NOTE BY PROFESSOR WURTZ.—Contributions and items for which I am, as a Scientist, individually responsible, will have attached my full name or initials.—H. W.]

FRIDAY, DECEMBER 3, 1870.

WISHING TO MAKE this Journal an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of those subjects a pleasure, or a profession.

Subscribers would confer a favor upon us by remitting *CHECKS* or *POST OFFICE MONEY ORDERS*, as we are frequent losers where money is enclosed in letters.

☞ NEWS AGENCY.—The American News Company, 119 and 121 Nassau street, New York, are agents for this Journal. Newsdealers will please send orders to them.

NOTICE.

☞ *All Collections for Advertisements, Subscriptions, etc., are made directly from this Office. We have Agents to solicit the same, but they are not authorised to Receipt for Money.*

TO OUR SUBSCRIBERS AND PATRONS.

In making remittances for subscriptions, always procure a draft on New York, or a POST OFFICE MONEY ORDER, if possible. Where neither of these can be procured, send the money, but always in a REGISTERED LETTER. The registration fee has been reduced to fifteen cents, and the registration system has been found by the postal authorities to be virtually an absolute protection against losses by mail. ALL Postmasters are obliged to register letters whenever requested to do so.

CONTENTS.

☞ An asterisk (*) denotes an illustrated article.

*McCracken's Gas Apparatus.....161
Chemical Repertory.....162
Photometry as Applied to the Estimation of the Value of Coal Gas.....163
*The Chemical History of a Candle.....164
The Causes of Spontaneous Ignition of Coal.....165
The Fuel Question.....165
Discovery of a Peat Bog in Montgomery County, Ohio.....166
CORRESPONDENCE—
For the Scrap Book—The Prevention of Boiler Scale.....166
List of Subscribers to Smedberg's "Synopsis of British Gas-Lighting".....166
Theory of the Bunsen Flame.....166
Advertising Index.....176
GENERAL EDITORIALS—
The American Iron Purifying Process.....168
The Photometer.....168
A New and Remarkable Cannel Coal.....169
Sale of a Baltimore Gas Company to Brooklynites.....169
Special Notice.....169
Answers to Correspondents.....169

GENERAL EDITORIAL.

THE AMERICAN IRON-PURIFICATION PROCESS.

We have already alluded in these columns to the discovery, made more than two years ago, by ST. JOHN & CARTWRIGHT, of this city, of the remarkable facility and surprising power with which our peculiar American mineral, known as the Staten Island Island Iron Ore, absorbs the sulphur from gas. Practically, the importance of this discovery opens upon us more and more, insomuch that we have made it a special subject of examination and investigation, the results of which we shall communicate to the gas public through this Journal, in a series of articles on the subject, to be initiated at an early day.

The question has occurred to several with whom we have conversed, and will probably occur to any but a skilled chemist, familiar with the mineral itself; why should it have this surpassing power? In this present reference to the subject we shall endeavor to give, as concisely as we can, the points, both chemical and mineralogical, which will make this clear. Of course we do not want to be understood to imply that this discovery of ST. JOHN and CARTWRIGHT was a result of reasoning founded upon known chemical and minerological principles, by those gentlemen It was arrived at by them as the reward of long and patient practical examinations of the purifying action of a large number of varieties of American ores, including bog ores, brown and red hematites, ironstones, and so on. It was therefore much more of the character of an invention than a discovery, though partaking of both. These gentlemen possessed very unusual advantages and facilities for such experiments, in their official positions in connection with the great Works of the New York Light Co.; which, in make of gas, ranks among the largest on this Continent. Their success with this ore was of so striking a character that this Company at once adopted, and has since used, their methods. Of course, there were at first practical difficulties of detail to be overcome, as in all inventions, in every art, but energy and patience have mastered them all; and the perfected methods of ST. JOHN and CARTWRIGHT now stand before the public in a position to challenge comparison, in view of results actually accomplished and on record, regarding both economy of work and purity of product.

When a new improvement has been brought into use, it is always interesting, and generally profitable, to apply scientific analysis to it, and ascertain "*why* this is thus." Though there are those who will cry: what is the use of that? being satisfied with knowing and utilizing the *fact*, this being in their idea the only "practical" consideration; yet there is a large class who will accept the fact with far more satisfaction when they know that there are sound scientific principles on which it reposes. In this case therefore, we shall proceed to show that these exist.

At the time of the first introduction of the important invention of HILLS into Great Britain, it was quickly seen that great advantage would accrue from the use of natural products, that is iron ores, of the right texture and activity, and such were sought for, *bog ores* being generally adopted. Moreover, it was obvious that to save first cost, those of a crumbly or pulverized kind were preferable. HILLS even tried to convert artificial oxide into a "granular form," like gunpowder; but if cost were not here fatal, the pressure, or other means, necessary to cake the mass, destroys the porosity essential to activity. Hence LAMING endeavored, by introduction of other materials, to overcome these difficulties, though at the expense of a virtual dilution of the material with matter almost inert. Another important element which concerns us is the one on which the great litigation turned, by which HILLS'S patent itself was established, that is, the use of oxide of iron in *hydrated* forms. The practical fact was found to be, or has at least passed into general practical acceptation; that the more the oxide departs in composition from the proportion of water which occurs in the artificial precipitated oxide, the less efficient is it on the sulphur in the gas. Here are *four* conditions therefore of efficiency of an oxide for gas purification, *purity*, *porosity*, *granular texture*, and high degree of *hydration* or combination with water.

Now it is most remarkable that this Staten Island Ore, which has been deposited in such vast stores, right in the midst of the greatest centres of our population, as if by a special providence, combines, probably in greater degree than any other iron ore yet discovered, these five conditions of efficiency which I have pointed out. The limits of this article have, however, already been surpassed, and the pursuance of the subject, involving some mineralogical considerations, must await our next.—H. W.

THE PHOTOMETER.

The very lengthy and interesting lecture on "Photometry as Applied to the Estimation of Coal Gas," delivered recently at the meeting of the British Association of Gas Managers in London induces us to say a few words on that subject.

It is a matter of surprise that so few gas-light companies use the photometer in their otherwise complete works. Although many of them, particularly in large cities have provided themselves with photometers, and institute frequent tests of the relative value of the gas they manufacture, a large number have abstained from procuring this necessary apparatus, and do not possess the means of conclusively determining either for their own satisfaction or that of their customers, the quality of the gas produced. It is well known that the only means of arriving at the true value of artificial light is by comparative essays, by burning the substance whose illuminating power is to be tested, against a light assumed by universal consent, to be the standard. The standard generally used is a sperm candle, 6 to the pound, consuming at the rate of 120 grains per hour, and the light to be tested is said to possess this power of so many candles, according to the number of times its brilliancy exceeds that of the standard, or it is expressed in fractional parts of a candle when it is exceeded by the standard in diffusing light.

From all we can learn we find the number of gas works using the photometer is absolutely inconsiderable, and aside from their clearly defined duty to their consumers in being ready at all times to satisfy them as to the quality of the gas sold them, it would seem to be desirable that the companies should be themselves every day informed of the value of the gas they are producing, to enable them to ascertain the relative value of coals and their admixtures.

Gas is apt to vary in illuminating power owing to a number of circumstances, and of course it is to the interest of the companies to know this, and to take the proper steps to remedy the deficiency, and always to maintain the proper quality. It is no less a matter of justice to consumers than to the companies themselves, to have at hand a ready means of exhibiting to the purchaser the quality of light for which he pays a uniform price whether good or bad, and of which he has no means of judging but by the mere dicta of the producer. But the right of the

consumer to be satified of the quality of the gas supplied is unquestionable. It is not enough that a company is the only company supplying gas in a city, and the consumers must take that or go without any. There is a concurrent right on the part of the consumer to know that in sustaining a monopoly he is not injured thereby, and that while he pays for light he is fairly dealt by as to quality.

Every gas company should have a photometer room arranged adjoining their office, so that during business hours any consumer may come in and examine for himself the value of what he is buying. We commend this subject to the attention of those interested.

A NEW AND REMARKABLE CANNEL COAL.

[Not the least remarkable thing about this new *Red Bank Cannel* is that such a thing as is related below could occur at this late day. "We tell the tale as 'twas told to us," and cannot doubt its entire verity. Samples of the new mineral have reached us, but at too late an hour to enable us to present here a full statement of its qualities. At first glance it has the very characteristic aspect of some of the English Cannels, having the cuboidal jointage and dull black conchoidal fracture, but on looking closer, strange peculiarities appear. The fractured surface is full of minute glistening points as if it had a finely crystalline (almost crypto-crystalline) texture. The strangest thing, however, is that when cut, or even rubbed, with a knife blade, it assumes a *brilliant lustre*, precisely like *graphite* or plumbago. It easily streaks paper, the streak having a slightly olive-brown tinge, and being (as observed by the writer in the case of *grahamite*) indelible by india-rubber. It might be used for making a sort of crayon. This would seem to indicate an admixture of soms thing similar to the *viscosine* of the writer. In thefire it burns much like a good ordinary cannel, cracking to pieces with some decrepitation, without any caking, yielding a voluminous and cheerful flame, and leaving considerable white ash.

A full account of all its properties, chemical and otherwise, will soon be be given to our readers. Information regarding this highly interesting mineral may be obtained on application to Mr. Geo. H. Brewer, No. 86 South st. N. Y. No doubt can exist of a foundation for the concluding remark of the letter below. Its locality is such that it can doubt less be delivered in our sea-board cities at a figure which will leave imported cannels no chance whatever. H. Wurtz].

New Bethlehem, Clarion Co., Pa,
September 26, 1870.

Messrs. Bird, Perkins & Job: * * * Our property is located in Armstrong County, on Red Bank River, ten miles above its junction with the Allegheny. We are sixty-five miles north of Pittsburg, on line of extension of Allegheny Valley Railroad, now building. The seam runs from twelve to fifteen feet in thickness, with a uniform stratum in bottom of two feet of common soft coal, nothing intervening; the bottom is black slate and roof the same. It lies geologically about fifty feet above the ferriferous limestone, with one four foot vein of soft coal between, and occupies about the position of the "C vein" in the measures; but it is my opinion that it is of itself a supplementary seam, more of the character of a local deposit, but of quite large extent. Our 650 acres was chosen as commanding the whole area approachable.

It is in a summit territory, and has about 100 feet of cover, this cover carrying two other heavy veins of very excellent soft coal and summit vein of limestone and iron ore, and top still mounted with fine farms on table lands finely cultivated. Twelve feet above the cannel seam comes in a four and a half feet vein of excellent soft coal.

The farmer used to mine out the two feet of soft coal underneath and let the cannel remain, not knowing it as coal; a large amount had accumulated at the drift. A Welsh miner tramping up through from Pittsburg, digging out winter's coal for farmers here and there, was employed by this one to dig his coal, and was directed to the bank; he came back directly, saying there was five years stock dug already at that place. He was told he must be mistaken; he said he was not, it was as fine cannel coal as ever he saw in the old country; the long and short of it was he had to make a fire on the ground with the cannel to convince the farmer that the stuff would burn.

I accidentally stumbled on it, have interested some personal friends in Boston, and have pitched my tent here. We are in about 450 feet, and find the coal improving as the cover increases; it runs level and regular. We hope in another year to have rail communication, and to settle the tariff question, so far as English cannel is concerned. Very truly yours,

James H. Mayo.

SALE OF A BALTIMORE GAS COMPANY TO BROOKLYNITES.

We understand a recent sale of the old Baltimore Gas Company to parties in Brooklyn, N. Y., has caused a vast amount of tall speculation among both interested and disinterested parties They are represented to have sold out for the handsome round sum of three million dollars. It has been intimated this transfer or sale—if it be real—was made by the old company because of the opposition they dreaded in the new People's Company, composed chiefly of New Yorkers, or which has been and is being built mainly by New York capital.

It is alleged there is no connection whatever between the old and new companies in the recent sale; that they are entirely separate and distinct, and in positive opposition. The new company has some thirty miles of mains laid in the upper section of the city and are putting down more. They are ready (nearly so) to supply the public with gas.

SPECIAL NOTICE.

We desire to direct the attention of all Engineers and Superintendents, and others interested in Gas matters, to the advertisement refering to Smedberg's "Synopis of British Gas-Lighting" to be found in another column.

Every Gas-Light Company in the country should subscribe for this magnificent work *now*. In a pecuniary sense alone it will pay its cost hundreds of times over, in the new and valuable information given, showing how to increase dividends, and at the same time improve gas, and lessen labor, etc.

We notice several companies have subscribed for from two two to four copies, making a present of these to their Superintendents. This is proper, and will be money well invested.

Those who send in names now, will have the work sent to them as soon as it is published, and the subscription is to be paid at that time. Subscription Price $15. Address Editors American Gas-Light Journal, 42 Pine street, N. Y.

Prof. W. A. Aiken's Report.—In the interesting report of Prof. Aiken's inspection of the uniform high illuminating power of the gas made by the Baltimore Gas Company, in the issue of Nov. 2, 1870, it should have been mentioned that the gas was made from Newburg Coal.

Answers to Correspondents.

B. J. R. of Ohio.—You will find the information you desire fully detailed in Muspratt's new work, which contains the fullest account we have seen.

D. W. of Jackson, Miss.—Your name *is* down twice on the list of subscribers to Smedberg's "Synopsis of British Gas-Lighting," and will correct the mistake, which must have occurred as stated by you.

Enquirer.—Beggs' Gas Regulator is one of the best devises of its kind ever brought to notice. Its advantages are not at all over-estimated. We are convinced if yon were to give it a trial you will be perfectly satisfied.

C. A. P. of Ind.—Clay retorts usually leak for a short time after being used, owing to the porosity of the material of which they are made. The pores, however, soon become choked up with carbon, and little or no loss afterwards occur.

A SYNOPSIS OF

BRITISH GAS LIGHTING.

To be Published Shortly.

"Winnowed.—The wheat carefully preserved, and the chaff thrown away."

This work will comprise the essence of the London *Journal of Gas-Lighting*, from February 10, 1849, to December 31, 1867, and afford a succient resume of the entire English Gas Engineering between these dates.

The excerpts will, as far as possible, be symmetrically arranged under the heads of Coals, Distillation, Purification, Volumetry and Photometry.

It is to be executed by James R. Smedberg, Engineer San Francisco Gas-Light Company. Subscriptions should be addressed to the offices of the American Gas-Light Journal, 42 Pine st Room 18, New York.

It will be issued only to subscribers.

It will be of great value, not only to Gas Companies and Engineers, but to those who represent the enormous collateral interests of Gas-Lighting—to chemists, Gas-Fitters and Patentees, as well as to scientific men generally.

Subscription price, $15.

NOW READY, AND FOR SALE,

FODELL'S SYSTEM

OF

Bookkeeping for Gas Co.'s.

Price $5, which should be sent either in Check, P. O. Order, or Registered Letter.

Blank books, with printed headings and forms on this System, will be supplied to Gas Companies, by applying to W. P. Fodell, Philadelphia, or

M. L. CALLENDER & CO.,
Office Gas-Light Journal, 42 Pine st., N. Y.

FOR BRONZING,

USE THE CELEBRATED

German Bronze Powders.

Imported by J. MARSCHING & CO., 42 John street, New York.
All shades of Chandelier Bronze constantly on hand.
Mail orders promptly attended to at lowest prices.

LIGHTING STREET LAMPS

With BARTLETT'S PATENT TORCH and IMPROVED KEY, is being adopted everywhere. No Lighter who has once seen it will do without it. It pays for itself quickly; saves great expense and labor, and also wear and tear of Lamps and Lamp Posts.

☞ This is the new process for Lighting and Extinguishing Street Lamps, which has been in use in New York City for over a year past.

J. W. BARTLETT, 562 Broadway, N. Y.

To Gas and Water Meter Manufacturers, Machinists, and Others.

J. H. ROBINSON & CO.,

ENAMELLERS, DIAL AND TABLET MANUFACTURERS,

THE MERSEY WORKS,

347 Grafton Street, Liverpool.

Manufacturers of Gas, Water, and Station Meter, Clock, Timepiece, Tell-Tale and Log Dials.

Lettered Addresses, Number and Name Plates, etc., Imperishable; and superior articles at reasonable prices.

Number Plates on Copper 5s. per dozen. 259-3m

GEO. H. KITCHEN & CO.,

NEW PATENT

GAS APPARATUS

For Country Residences, Public Buildings, &c.,

FROM $300 UPWARDS.

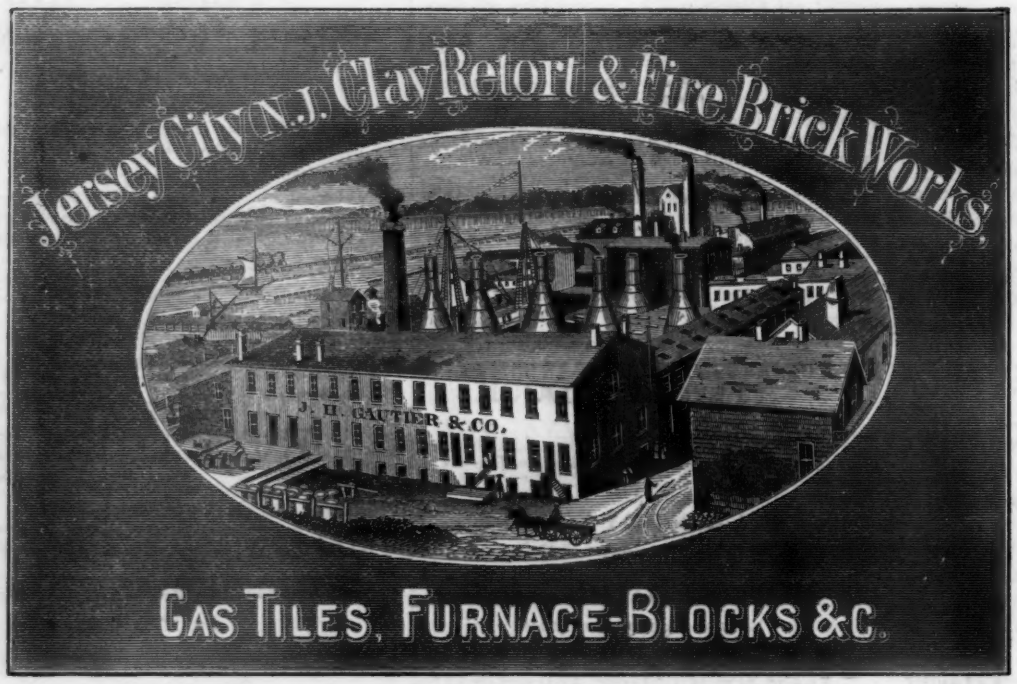
EVERY DESCRIPTION OF GAS FIXTURES.

Gas Fitting in all its branches

591 Broadway NEW YORK.

A COMPETENT GAS ENGINEER, FOR MANY years connected with City Gas Companies, competent to Construct and Manage Works of the largest capacity, is open for an engagement. Address ENGINEER, Office Gas-Light Journal, 42 Pine street, N. Y.

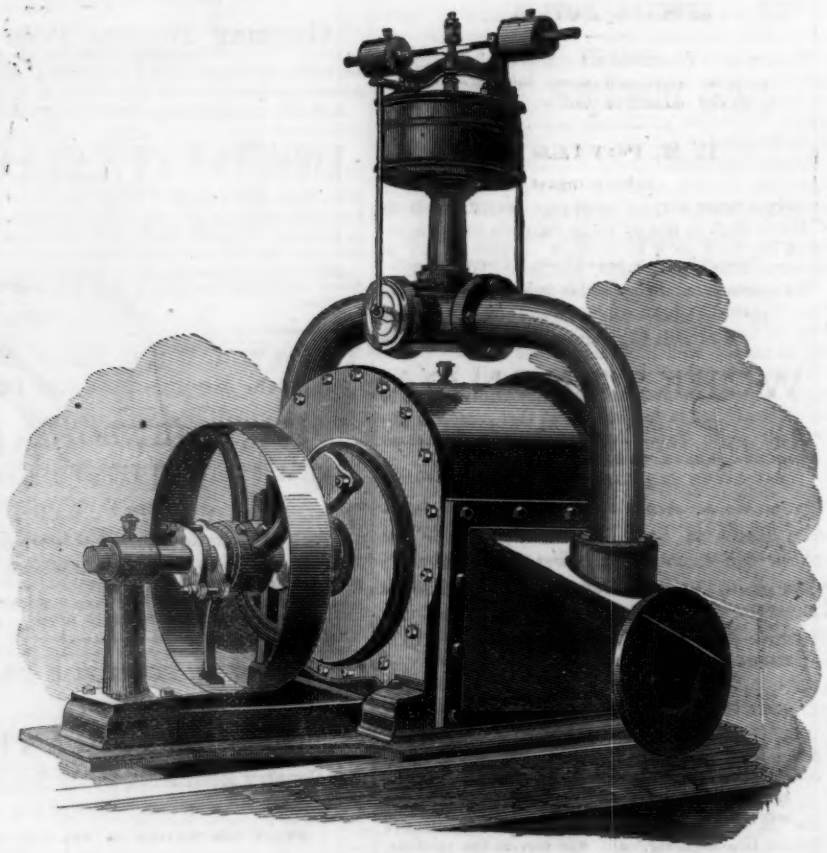
WANTED—A SITUATION AS SUPERINTENDENT of a Gas Works making from one to fifty thousand feet per day; is thoroughly acquainted with the Manufacture and Distribution of Coal Gas, in all its details. Address "GAS FITTER," office of this Journal. 261-6t



Smith & Sayre Manufacturing Company.

The Mackenzie Patent Gas Exhauster,

AND PATENT COMPENSATOR.



They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the production and illuminating power of the gas, and add very much to the durability of the retorts, either clay or iron. The Compensator obviates entirely the necessity of water-joints, is compact, durable cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

We are also sole proprietors and manufacturers of the

MACKENZIE PATENT BLOWER, PATENT CUPOLA AND SMELTING FURNACE.

The Blower is a Force Blast machine, durably built, and can be driven with one-third the power required to drive the ordinary Fan. The Cupolas are manufactured in sizes to melt from 1 ton to 20 ons per hour, will save one quarter of the time required by the old style Cupola, and 33 per cent. fuel. Address

B. KREISCHER,, President.
JAMES SAYRE, Treasurer,
CHARLES W. ISBELL, Secretary
Office, 95 Liberty street, New York.

Graham's Patent Lamp Post.

ANTI-FREEZING.

MORE SIMPLE, MORE CHEAP, MORE USEFUL, LESS LIABLE TO GET OUT OF ORDER, and gives a more PERFECT LIGHT than any other Lamp Post known. It is the ONLY REALLY ANTI-FREEZING LAMP POST ever offered to the public. The improvement is applicable to OLD POSTS at a TRIFLING COST.

The invention consists mainly in dispensing with the interior gas pipe, by simply closing the bottom of the Lamp Post and tapping it five inches from the bottom for the service pipe.

The top is fitted with a plug or stopper to take in a short piece of pipe with the stop-cock and burner. The interior of the Post thus forms a large gas chamber and condenser for all moisture and impurities which fall to the bottom, leaving the gas free and pure at the burner.

For manufacturing rights and rights to use, or other information, address

J. W. GRAHAM, Chillicothe, Ohio, or
EDITORS AMERICAN GAS-LIGHT JOURNAL, 42 Pine st., N. Y.

LUDLOW VALVE MF'G CO.

OFFICE 193 RIVER ST., TROY, N. Y.

Make Valves—Double and Single Gate—4-inch to 36 inch, for Water, Gas and Steam.

"CINCINNATI, March, 1870.

"I would say that if any certificate or affidavit is desired in relation to the superior character of the Ludlow Valve above others that I have seen, the same will be cheerfully given. I think, however, that the Valve proves for itself.

"JOSEPH P. MAYER,
"Superintendent Water Works."

"DAYTON, OHIO, June 27, 1870.

"I have to say that we find them always in order—operating easily under all degrees of pressure. In a word, they have given perfect satisfaction in every particular.

"GEORGE LEHMAN,
"Chairman Water Works Committee."

"CANTON, OHIO, June 27, 1870.

"We are now using and have been, since the commencement of our works, your valves, and they are proving entirely satisfactory.

JOHN S. SHORB,
"Superintendent Water Works."

"PEORIA WATER WORKS, July, 1870.

"With pleasure I can testify to their superiority. Their action has been perfect under all degrees of pressure, and have given perfect satisfaction.

"S. A. KINSEY, Ex. Sup't.
"JOHN J. STEIGER, Sup't."

"BROOKLYN GAS LIGHT COMPANY.

"I take great pleasure in saying that they give perfect satisfaction—opening easily and quickly, and requiring no effort to start them; even after they have been closed for months.

"A. F. HAVENS, Engineer."

"OFFICE OF PHILADELPHIA GAS WORKS, 14th June, 1870.

"I am pleased to state that the lot of large Gas Valves bought from you (Hart & Buck), as agents of the Ludlow Valve Manufacturing Co, have given me perfect satisfaction. The double gate water valve, bought for a special purpose, also works admirably. We want no better valves. The Indicator on your valves is a great improvement over the old style.

"THOS. R. BROWN, Engineer."

MITCHELL, VANCE & CO.

Manufacturers of

CHANDELIERS

And Every Description of

GAS FIXTURES.

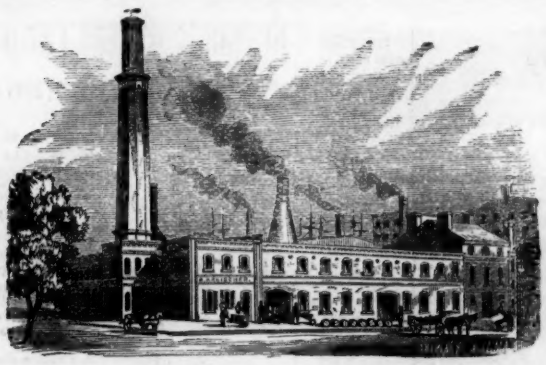
Also Manufacturers of

Fine Gilt, Bronze and Marble Clocks, Warranted best Time-keepers, Mantle Ornaments, &c.

SALESROOM, 597 BROADWAY,

(Rear Entrance 140 Mercer Street.)

Special designs furnished for GasFixtures or Churches, Public Halls, Lodges, &c. } **New York**



NEW YORK

Fire Brick and Clay RetortWorks

☞ *Established in* 1845. ☜

(Branch Works at Kreischerville, Staten Island.)

B. KREISHER & SON,

Office 58 Goerck St, cor. Delancey, N. Y.

GAS RETORTS, TILES and FIRE-BRICK of all shapes and sizes.

FIRE MORTAR, CLAY, and SAND.

Articles of every description made to order at the shortest notice.

B. KREISCHER & SON.

MANHATTAN

Fire Brick & Enamelled Clay Retort Works,

MAURER & WEBER,

(Of the late firm of B. Kreischer & Co.)

PROPRIETORS.

Office & Works in 15th street, Avenue C,

MANUFACTURERS OF

Fire Brick and Tiles,

OF ALL SHAPES & SIZES,

Fire Mortar, Clay and Sand.

☞Articles of every description made to order, at short notice. (135

HY. MAURER. ADAM WEBER.

LACLEDE FIRE BRICK

AND

CLAY RETORT WORKS

CHELTENHAM, ST. LOUIS CO., MO.

HAMBLETON & GREEN

PROPRIETORS,

Office, No. 1007, North Levee,.....St. Louis.

MURRAY & BAKER.

PRACTICAL BUILDERS

AND CONTRACTORS FOR THE

ERECTION OF GAS WORKS.

Manufacturers of all the latest and most improved

APPARATUS AND TOOLS

FOR THE

Manufacture and Distribution of

COAL GAS.

WORKS AT THE RAILWAY DEPOTS,

FORT WAYNE, INDIANA.

We manufacture Bench Castings, Washers, "The Immersed Multitubular," and Atmospheric Condensers, Wet and Dry-Lime Purifiers, Dry Center Seals, Telescopic and Single Gas Holders Wrought Iron Trussed Roof for Iron or Slate, Wood and Iron Trays for Purifiers, Coke and Coal Carts, Wrought Iron Screening shovels, and Castings and Wrought Work of every description for Gas-works.

As Mr. Murray is a Practical Draughtsman, we will furnish plans and specification to parties or Associations, or will wait personally upon parties contemplating the construction of new works, or the alteration or extension of old ones.

The most satisfactory references can be given, if required, of the experience and commercial fairness which characterises our dealings.

We would respectfully invite Western men to call and see our patterns and works here. MURRAY, & BAKER,

198-1y Fort Wayne, Indiana,

TRINIDAD BITUMEN.

EQUAL TO BOGHEAD CANNEL FOR INCREASING the illuminating qualities of Gas.

Nothing better or cheaper in the market.

For particulars apply to

New York and Trinidad Company,

21, NASSAU STREET,

NEW YORK.

P. O. Box 966. 255-6m

ATLANTIC DOCK,

IRON AND MACHINE WORKS,

Ferris, Wolcott and Dykeman Streets,

SOUTH BROOKLYN.

HOY, KENNEDY & CO., Agents.

Office 98 Liberty Street. P. O. Box 2,348.

HOY, KENNEDY & CO.,

ENGINEERS AND CONTRACTORS

For the Erection or Extension of Gas Works.

PLANS, SPECIFICATIONS AND ESTIMATES.

MANUFACTURERS of every kind of Gas Machinery, Retorts, Bench Castings, Wrought Iron Work, Multitubular and Air Condensers, Washers, Scrubbers, Purifyers, Exhausters with every equipment complete for large or small Works, Gasholders, Telescopic or Single; Iron Roof Frames with Cornice Gutters, covered with Corrugated Iron or Slate; Iron Doors and Iron Pivot Blind Windows; Coke Barrows, Fire Tools, Retort Lids, Cotter Bars and Screws, Stop Valves, Tar Valves for Regulating Dip in Hydraulic Mains, Pressure Governors for Street Mains, and Compensators for Exhausters that are unrivalled for unvarying accuracy; Steam Engines, Boilers, Etc., Etc.

Agents for G. W. EDGE'S PROCESS for removing Carbon from Retorts.

Post-Office Box 2,348. Office, 98 Liberty st., N. Y. (224-1y

JERSEY CITY

GAS METER WORKS.

R. M. POTTER & CO.,

MANUFACTURERS OF

CONSUMERS GAS METERS, WET AND DRY,

Station Meters, Center Seals, Governors,

Pressure Registers, and all kinds of Pressure Gauges,

Experimental Meters and Standard Test Gasholders.

☞ And all apparatus in use at the Gas Works. ☜

14 Morris St., Jersey City, N. J. (1y.

WORKS UPON GAS.

BOWDITCH.—THE ANALYSIS, TECHNICAL Valuation, Purification, and Use of Coal Gas, with illustrations., 8vo. cloth. Price, $6.25.

THE GAS MANAGER'S HAND BOOK; consisting of Tables, Rules, and Useful Information for Gas Engineers, Managers, and others engaged in the Manufacture and Distribution of Coal Gas. By Thomas Newbigging; 8vo. cloth. $3.75.

BOWER—Gas Engineer's Book of Reference, illustrated, 4to. Price, 75c.

CLEGG—Treatise on the Manufacture of Coal Gas, 5th edition, enlarged, 4to, cloth. Price, $10.50.

COLBURN—The Gas Works of London, 12mo., boards. Price, 60 cents.

CROLL—Report of the Proceedings on the Arbitration with the Great Central Gas Consumers' Company, 8vo., cloth. Price, $2 50.

HUGHES—Gas Works and Manufacturing Coal Gas, 12mo. Price, $1.50.

MASON—The Gasfitters' Guide, paper. Price, 50 cents.

D'HURCOURT—De l'Eclairage du Gas. Par E. R. Hurcourt 3d edition. Paris, 1863; 8vo. and plates, $7.50.

RICHARD—Gas Consumers' Guide, 12mo., Price, 50 cents.

SWEET—Special Report on Coal, showing its Distribution, Classification, and Cost, delivered over different routes to various points in the State of New York, and the principal cities on the Atlantic Coast. By S. H. Sweet, with Geological Maps. 1 vol. 8vo. cloth, $3.

SUGG—Gas Manipulation, with a description of the various Instruments and Apparatus employed in the Analysis of Coal and Coal Gas, 8vo., cloth. Price, $7.50.

WILKINS—How to Manage Gas, 24mo., paper. Price, 25c.

SCHILLING—Traite d'Eclairage par le Gas. Price, $22.

For sale by

D. VAN NOSTRAND, Publisher,

23 Murray Street and 27 Warren Street

(Upstairs).

☞ Our new and revised Catalogue of American and Foreign Scientific Books, 56 p. 8vo., sent to any address, on receipt of six cents in postage stamps. 299

PHILADELPHIA

Fire Brick and Clay Retort Works,

Corner of Vine and Twenty Third sts., Philadelphia,

PHILLIP NEWKUMET,

SUCCESSOR TO

JOHN NEWKUMET,

Manufacturer of all kinds of FIRE-BRICK, GAS-HOUSE TILES, to suit all the different plans in use. Also, Fire Bricks, Blocks, Tiles, etc., etc., for Furnaces, Rolling Mills, Foundries, Lime Kilns, Glass Works, etc., etc., of superior quality.

Fire Clay, Ground Brick, Fine Mortar, Fire Sand and Kaolin constantly on hand.

Clay Retorts and Dentis' Muffles. Orders filled at short notice.

BROOKLYN CLAY RETORT AND

FIRE BRICK WORKS,

Van Dyke Street, Brooklyn, New York,

MANUFAUTURERS OF

CLAY RETORTS FIRE BRICK, TILE, Etc.

OREGON IRON FOUNDRY

738, 740, 742 and 744,

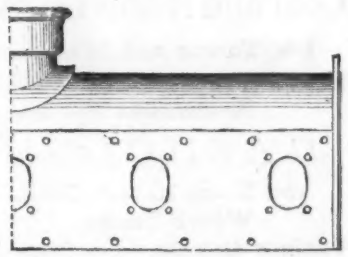
Greenwich Street, New York.

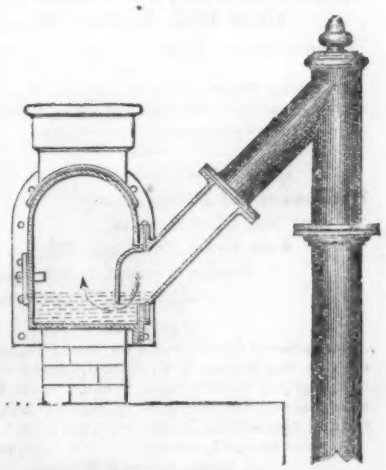
CASTINGS FOR

GAS WORKS

OF ALL DESCRIPTIONS, INCLUDING

Purifiers, Exhausters, Compensators, Self-Acting Valves, Branches, Bends, &c.





Floyd's Patent Adjustable Main.

FOR BENCHES OF 1, 2, 3, 5 and 6 RETORTS.

By the removal of the front plate only the Main can be adopted to Settings of any number of Retorts desired. The Patent Main can be applied to the ordinary D shaped Main. It offers great facilitie for cleaning, and is not liable to stoppage.

FLOYD'S PATENT

Malleable Iron Retort Lid.

SABATTON'S PATENT

Furnace Door and Frame.

REFERS TO—J. A. Sabattan, Esq., Engineer Manhattan Gas Co.—Col. A J. White, Metropolitan Gas Co.—C. C. Mowten, Engine New-York Gas-light Co.—J. Mowten Saunders, Engineer Baltimore Gas Co.—John T. Harrison, Engineer Savannah Gas Co.

.86] HERRING & FLOYD, Proprietors

SILAS C. HERRING. JAMES R. FLOYD

KEYSTONE IRON WORKS,

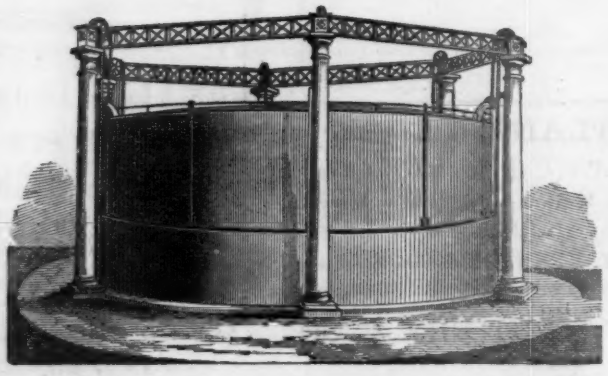
2132 Filbert Street, Philadelphia.

G. W. KRAFT, PROPRIETOR,

MANUFACTURES

GASOMETERS,

COAL CARS, PURIFYING OXES, COKE BARROWS.



RETORT HOUSE ROOFS WATER TANKS

Wrought Iron Work for Bridges, Buildings, Steam Boilers, Tanks, Stills, &c.
Particular attention paid to Alterations and Repairs.

Providence Steam and Gas Pipe Co.,

PROVIDENCE, R. I.,

BUILDERS OF

Coal and Rosin Gas Works,

For Towns and Manufactories.

Estimates furnished of the cost of Works, and cost to manufacture Gas in any locality.

GASHOLDERS.

Iron Truss Retort House Roofs,
Water Tanks,
Purifier Covers, Coke Barrows,
Cast Iron Socket Pipe.

Particular attention given to Enlarging and Re-building Gas Works.

For Lighting Manufactories, our Rosin Gas Works have been successfully used for *many years* past. They require but a small outlay, and afford a *safe* and *economical* light.

FOR SALE AT MANUFACTURERS PRICES:

Exhausters and Compensators,
Iron and Clay Retorts,
Fire Brick, Clay and Tile.
Roman Cement and Rosin,
Station and Consumers' Meters.

REFER TO

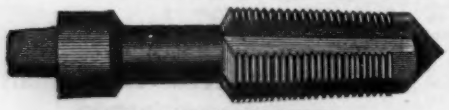
Manufacturers' Gas Co., Fall River, Mass.; Youngstown, Ohio, Gas Co.; New Rochelle, N. Y., Gas Co.; Homer and Cortland, N. Y. Gas Co.; Danbury, Conn., Gas Co.; North Bridgewater, Mass., Gas Co.; Cold Spring, N. Y., Gas Co.; Rockville, Conn., Gas Co.; Taunton, Mass., Gas Co.; Pawtucket, R. I., Gas Co.

FREDERICK GRINNELL, President, J. C. HARTSHORN, Treas.
S. MILLETT THOMPSON, Secretary.

Office and Manufactory, corner of Pine and Eddy Streets, Providence, Rhode Island.

Office in Syracuse, N. Y., No. 1 Granger Block.

H. A. BRANCH, Agent.



HUMPHREY'S

COMBINED DRILL, REAMER, AND TAP.

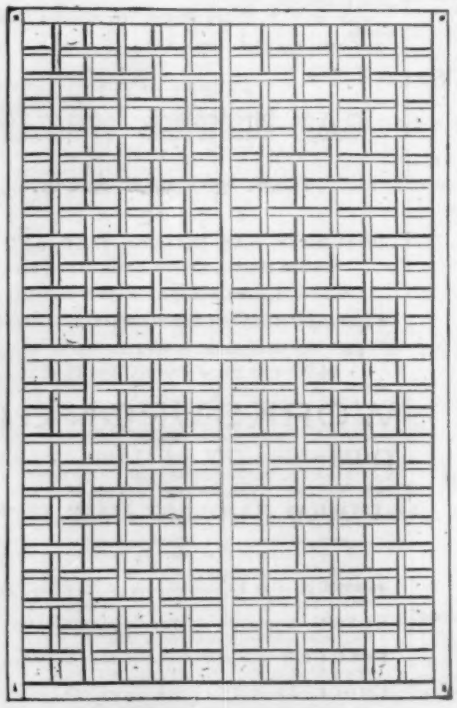
The best tool for Tapping Gas and Water. Address,

WILLIAM HUMPHREY,
Waterford N. Y.

344–6m

AMERICAN

Gas Screen Manufacturing Company,



TO GAS-LIGHT COMPANIES.

Your attention is respectfully called to the new and improved Patent GAS SCREEN, now being manufactured by the "American Gas Screen Manufacturing Company," under the patents granted to E. DUFFEE, and are pleased to submit the following points of their excellence and superiority over all other Screens now in use.

The Screen is made with an Oak Frame, interlaced with split rattan drawn through holes at regular intervals in the Frame and cross pieces, the edges of the frame being grooved to prevent abrasion.

The advantages of the Screen are:

1st. The large purifying surface, the construction of the Screen giving over three-fourths of the surface for the gas to penetrate the lime.

2nd. On account of the free passage of the gas through the screen the pressure is reduced, thereby preventing the accumulating of carbon on the retorts.

3rd. The saving of lime and labor, as the screens are not liable to clog, and are easily cleaned,

4th. Their cheapness and simplicity of construction.

5th. Their *durability*—they can be used longer than any other now used.

Testimonials.

EAST BOSTON, February 22, 1870.

Mr. E. DUFFEE—Dear Sir: We have used your Trays for the last five years in our works, and find them to last the longest, and give the best satisfaction of any we have ever used.

Respectfully yours,
WM. W. WEST, Sup't.

CHELSEA, July 20, 1870.

Mr. E. DUFFEE—Dear Sir: I have used your Purifying Trays for three years, with entire satisfaction to our company. For durability and cheapness I am convinced they are the best with which I am acquainted. By the increased purifying capacity of your Trays, it relieves the pressure on the retorts, and prevents the accumulation of carbon, and also saves lime and labor.

J. M. SOMER, Sup. Chelsea Gas Co.

DORCHESTER, March 8, 1870.

Mr. E. DUFFEE—Dear Sir: We have had your Gas Trays in constant use for almost one year and six months, and find them superior to any others we have ever used, both in point of economy and efficiency.

Truly yours,
W. B. BROOKS,
Agent Dorchester Gas-Light Co.

BANGOR, August 2, 1870.

EDWARD DUFFEE, ESQ.—Dear Sir: Yours of the 20th ult. is received. In regard to your Gas Trays I take pleasure in saying that they have been in use over two years and have given perfect satisfaction, and they are in good order at the present time; should have no hesitation in recommending them, believing they are the most durable and easiest kept in order of any with which I am acquainted.

Respectfully yours,
W. H. PERRY, Superintendent.

The following Gas Companies are now using the American Gas Screen Company's Screen:

Boston Gas-Light Co., Mass.
East Boston Gas-Light Co., Mass
Chelsea Gas-Light Co., Mass.
Dorchester Gas-Light Co., Mass.
Roxbury Gas-Light Co., Mass.
Jamaica Plain Gas-Light Co., Mass.
Salem Gas-Light Co., Mass,
Lawrence Gas-Light Co., Mass.
Haverhill Gas-Light Co., Mass.
Taunton Gas-Light Co., Mass.
Newburyport Gas-Light Co., Mass.
Malden Gas-Light Co., Mass.
Webster Gas Light Co., Mass.
Fall River Gas-Light Co., Mass.
Manchester Gas-Light Co., N.H.
Concord Gas-Light Co., N. H.
Dover Gas-Light Co., N. H.
Great Falls Gas-Light Co., N.H.
Bangor Gas-Light Co., Maine.
Lewiston Gas-Light Co., Maine.
Biddeford Gas-Light Co., Maine.
Providence Gas-Light Co., R. I.
Woonsocket Gas-Light Co., R. I.
Meriden Gas-Light Co., Conn.
Bridgeport Gas-Light Co., Conn.
Philadelphia (Northern Liberty) Gas-Light Co., Pa.

The Company are now able to supply all Gas Companies with the above Screen. A trial is asked and satisfaction is guaranteed. Address

American Gas Screen Company,
Haverhill, Mass.

S. D. MAYNARD, President.
GEORGE W. DAY, Treasurer.
LUTHER DAY, Agent.
258–1y E. DUFFEE, Travelling Agent.

CLARK'S ENAMEL

FOR

GAS RETORTS AND FURNACES,

Chemical Apparatus and all Appliances

REQUIRING PRESERVATION FROM A HIGH HEAT.

INDESTRUCTIBLE, AND WILL NOT CARBONIZE.

IMPERVIOUS TO GAS AND ADDS TO THE STRENGTH OF A RETORT.

COST MODERATE.

Those desiring to test it can do so, free of cost, by communicating with WM. H. PAULDING, Sole Agent,
259–1y Office of the GAS-LIGHT JOURNAL.

SPECIAL NOTICE TO GAS-LIGHT COMPANIES.

REMOVAL.

THE OFFICE FOR THE SALE OF THE GENUINE **Sabbaton's Patent Coke Screening Shovels** is now at 96 MAIDEN LANE, where all orders will be promptly filled.

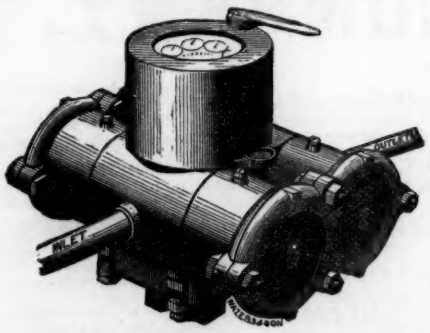
Recent improvements have made them indispensible to Gas Companies.

O. R. BUTLER,
252 Sole Agent, 96 Maiden Lane.

WORKING DRAWINGS
EXECUTED WITH ACCURACY & PROMPTNESS ALSO
PATENT OFFICE DRAWINGS
№ 42 PINE ST. ROOM 18 N.Y.

OFFICE GAS-LIGHT JOURNAL.

H. R. WORTHINGTON'S



PATENT WATER-METER.

This Meter is also used for the measurement of Oil —it combines

ACCURACY, SIMPLICITY, and REMARKABLE DURABILITY with such ease and certainty of motion, as to offer no appreciable obstructions to the flow of water in the pipes to which it is connected, as it runs and registers upon three inches head, or when delivering the smallest stream. These qualities, with its low cost, have caused its extensive adoption by corporations and individuals, in many of our largest cities.

HENRY R. WORTHINGTON,
61 Beekman steet, N. Y.

WILSON & GARDNER,

MANUFACTURERS OF

Clay Retorts, Fire Brick, Tile, Etc.,

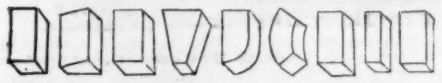
OF THE BEST QUALITY.

ALL SHAPES AND SIZES MANUFACTURED TO ORDER PROMPTLY.

Lockport, Westmoreland County, Pa.

FIRE BRICK.

No. 1. Arc Wedge. Key. Jamb. Circle. Bull-head. Soap. Split.



287-1y

NATIONAL FOUNDRY

AND PIPE WORKS.

Office and Works—Carroll, Pike, Smallman and Wilkins Streets.

PITTSBURGH, PA.

WM. SMITH,

Manufacturer of all kinds of GAS and WATER PIPE, BRANCHES, CONNECTIONS, T's, ELBOWS, and ALL CASTINGS USED AT GAS AND WATER WORKS.

offer special inducements to parties wishing to purchase, my Pipe is Smooth, regular in weights, and cast vertically.

N. B.—Pipe from 3-inch and upwards, cast in 12-ft. lengths.

SEND FOR CIRCULAR AND PRICE LIST.

149

JESSE W. STARR & SONS,

Camden Iron Works,

Camden, New Jersey,

MANUFACTURERS OF

All kinds of Castings and Apparatus for Gas Works,

WROUGHT IRON ROOF FRAMES,

for Retort and other houses. Retorts and all castings required for setting them in the latest and most improved model. WASHERS, CONDENSERS, SCRUBBERS and EXHAUSTERS, for relieving the Retorts from pressure. PURIFIERS, varying from 2,000 to 2,000,000 cubic feet daily purifying capacity.

Wrought Iron Lime Sieves,

for Purifiers. Station Meters of all sizes.

GAS HOLDERS,

Telescopic and Single,

with cast iron guide and suspension frames. GAS GOVERNORS or REGULATORS. STREET MAINS, from 1¼ to 48 INCHES DIAMETER, for WATER or GAS. Street Main connections, such as BRANCHES, BENDS, DRIPS, SLEEVES, etc.

STOP VALVES, from 3 to 30 inches, for both Water and Gas.

WROUGHT IRON WORK.

All the Smith and Sheet Iron work required in and about Gas Works. 226-tf

JESSE W. STARR. BENJ. A. STARR. BENJ. F. ARCHER.

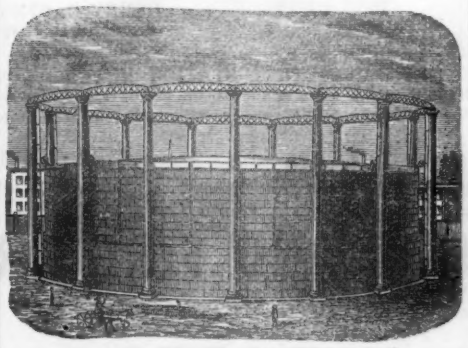
T. F ROWLAND.

Continental Works,

Greenpoint, Brooklyn, N.Y.

NEW YORK OFFICE, 64 & 66 B'WAY, ROOM 33.

ENGINEER, AND MANUFACTURER OF



GAS-HOLDERS

OF ANY MAGNITUDE,

Condensers, Scrubbers, Purifiers, Retorts, Hydraulic Mains, and all other articles connected with the Manufacture and Distribution of Gas, furnished with despatch: Plans and Specifications prepared, and Proposals given for the necessary Plans for Lighting Cities, Towns, Mansions, and Manufactories.

PROFESSOR HENRY WURTZ,

SCIENTIFIC AND PRACTICAL CHEMICAL AND GEOLOGICAL EXPERT.

26 Pine Street, Room 36, New York.

(Office Hours 1 to 4 daily, except Saturdays.)

Geological Explorations and Reports—Chemical Analyses—Advice and Investigations in all the Chemical Arts—Chemical Inventions and Improvements made.

[Professor W. makes a specialty of GAS-CHEMISTRY, and the Analysis of Gas and Gas Coals. Has unequalled facilities for this purpose; is an Editor of the AMERICAN GAS-LIGHT JOURNAL AND CHEMICAL REPERTORY.

Formerly a Chemical Examiner in the U. S Patent Office; and peculiarly competent in relation to Patent Rights, Contested Cases and Infringements.]

B. S. BENSON & SON.

95 LIBERTY STREET, NEW YORK.

MANUFACTURERS OF CAST IRON

GAS AND WATER PIPE,

AND FITTINGS FOR

GAS AND WATER MAINS, ETC.

All Sizes from 3 to 30 inches, Cast Vertically, in Lengths of 12½ Feet.

SCHOOL OF MINES,

COLUMBIA COLLEGE,

EAST 49th STREET, NEW YORK.

FACULTY:

F. A. P. BARNARD, S.T.D., LL.D., President.
T. EGLESTON, Jr., E. M., Mineralogy and Metallurgy.
FRANCIS L. VINTON, E. M., Mining Engineering.
C. F. CHANDLER, Ph. D., Analytical and Applied Chemistry.
JOHN TORREY, M.D., LL.D., Botany.
CHARLES A. JOY, Ph.D., General Chemistry.
WILLIAM G. PECK, LL.D., Mechanics.
JOHN H. VAN AMRINGE, A.M., Mathematics.
OGDEN N. ROOD, A.M., Physics.
JOHN S. NEWBERRY, M.D., Geology and Palæontology.

The plan of this School embraces a three years' course for the degree of ENGINEER OF MINES, or BACHELOR of PHILOSOPHY.

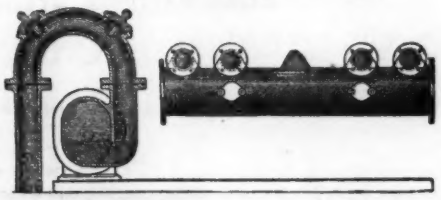
For admission, candidates for a degree must pass an examination in Arithmetic, Algebra, Geometry and Plain Trigonometry. Persons not candidates for degrees are admitted without examination, and may pursue any or all of the subjects taught. For further information and for catalogues, apply to

DR. C. F. CHANDLER
DEAN OF THE FACULTY.

80-1yr.

STANLEY'S

HYDRAULIC GAS MAIN.



WILLIAM TAYLOR & SONS,

COLUMBIAN IRON WORKS,

Nos. 11, 13 & 15 Adams Street, Brooklyn, N. Y.

MANUFACTURERS OF ALL KINDS OF

Castings. Iron Buildings. Store Fronts, Columns, Girders and Beams.

ALSO,

Gas Works Castings of all kinds.

Steam Engines, Mill Gearing, Hydraulic Presses for the manufacture of Linseed and Cotton Seed Oils, Sugar Mills, Single and Double Action Pumps, also Steam Pumps, Coal Oil Machinery, High and Low Pressure Boilers, Tanks, Kettles, Soap Curbs, &c.,

MADE AND REPAIRED AT THE SHORTEST NOTICE.

WM. TAYLOR. JAMES A. TAYLOR. EDWIN S. TAYLOR.

Gloucester Iron Works,

Office, No. 8 North Seventh Street,

PHILADELPHIA.

One and a half inch, 2 inch, 3 inch and 4 inch Bell Pipe on hand. Flange Pipe from 1¼ to 12 inch, made to order.

2581t SEXTON & CO.

CURLEY'S IMPROVED RETORT SETTING AND INDEPENDENT DAMPER.

Prevents the sudden Chilling Contraction, and early Destruction of the Retorts; more than doubles their durability, and maintains a high uniform heat.

For particulars address THOMAS CURLEY, Wilmington, Del. or C. E. SANDERSON, 42 Pine street, Room 18, N. Y. 258-tf

WILLIAM S. CARR & CO.,

Succesor to Sawyer & Co.,

SOLE MANUFACTURERS OF

Carr's Patent Water Closets,

SURINAL VALVE, &c.

Also Manufacturers and Dealers in PLUMBING MATERIALS OF EVERY DESCRIPTION, Plumbers' Brass Works, Earthen Ware, Pumps, Iron Drain Pipes, Traps and Sinks, Copper Bath Tubs, Showers, &c., &c.

MANUFACTORY, MOTT HAVEN.

106, 108, and 110 Centre Street, cor. Franklin.

NEW YORK.

Illustrated Catalogue and Price List sent on application. 152-176

GEO. STACEY. HENRY RANSHAW. WM. STACEY

GEO. STACEY & CO.,

MANUFACTURERS OF

GASOMETERS,

Wrought Iron Roofs.

And all kinds of Wrought Iron Work used in the erection of Gas and Coal Oil Works, Wrought Iron Bridges for Railroads and other purposes, Wrought Iron Joists and Girders for Buildings, Bridge Bolts, Jails, and Cells, Etc.

Manufactory, Ramsay street, opposite O. & M. R. R. Depot,

CINCINNATI, O.

REFER TO:

Cincinnati Gaslight Company
Cleveland, O., Gas Company.
Davenport, Iowa, Gas Co.
Nashville, Tenn., Gas Co.
Madison, Ind., Gas Company.
R. T. Coverdale, Engr., Cin.
Covington, Ky., Gas Company.
Baton Rouge, La., Gas Co.
Indianapolis Gas Company.
Dayton, O., Gaslight Company.
Terre Haute, Ind., Gas Co.

Roofs covered with either Corrugated Sheet Iron or Slate.

TO GAS MEN.—A RARE OPPORTUNITY.—FOR SALE, a Coal Gas Works situated in a growing village on the Hudson, about 50 miles from New York; consumption rapidly increasing; good reason for selling. Address, Eds. Am. Gas Light Journal, 42 Pine street, Room 18. 256—tf

THE AMERICAN METER COMPANY.

Organized under the General Manufacturing Laws of the State of New-York.

SAMUEL DOWN, President. HENRY CARTWRIGHT, Vice-President. THOMAS J. EARLE, Secretary.

Trustees:

SAMUEL DOWN WILLIAM HOPPER, R. H. GRATZ, HENRY CARTWRIGHT, RICHARD MERRIFIELD.
THOMAS C. HOPPER, Superintendent at Philadelphia.

This Company is now prepared to furnish WET AND DRY GAS METERS, STATION METERS, GOVERNORS, PRESSURE INDICATORS AND REGISTERS, SERVICE and METER COCKS, and all articles in their line appertaining to the use of Gas Works.

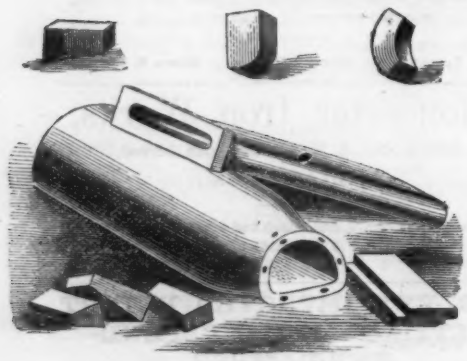
The combination of Mechanical and Scientific Skill, and the long experience of the several members of the Company, is a sure guarantee of durability, accuracy and excellence of Workmanship. Orders addressed

AMERICAN METER COMPANY,

West Twenty-Second Street, New York. Arch and Twenty-Second Streets, Philadelphia. No. 23 West, Street, Boston, will meet with prompt attention

BALTIMORE RETORT AND FIRE BRICK WORKS.

GEO. C. HICKS & CO.



Clay Retorts for Gas Works and Sugar Refineries.

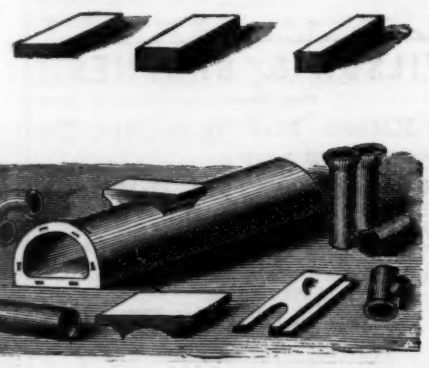
Tiles and Blocks of all kinds.

FIRE BRICK.

Fire Mortar, Fire Clay and Sand.

All kinds of Fire Clay Materials.

The only XX Fire Brick.



GEORGE C. HICKS
AUGUSTE LAMBLA,

Retorts of the various sizes kept on hand.

B. C. HARRIS, Jr.,
Z. F. PARUS.

HARRIS & BROTHER,

ESTABLISHED 1848.

PRACTICAL GAS METER MANUFACTURERS,

Continue as heretofore at the OLD ESTABLISHMENT, Nos. 1115 and 1117 Cherry Street, Philadelphia, Pa.,

To manufacture Wet and Dry Gas Meters, Station Meters, Experimental Meters, Meter Provers, Centre Seals, Governors, Pressure Registers, Indicators, Photometers, and all kinds of Gas Apparatus; Also furnish all other Articles appertaining to the use of Gas Works.

From our long Practical Experience of the Business (covering a period of 20 years) and from our personal supervision of all Work, we can guarantee all orders to be executed promptly, and in every respect satisfactorily.

J. Wesley Harris, Washington Harris, Wm. Wallace Goodwin.

P. P. DEILY, J. FOWLER.

DEILY & FOWLER,

39 LAUREL STREET, PHILADELPHIA, PENN.,

BUILDERS OF GAS-WORKS,

MANUFACTURERS OF

GAS-HOLDERS,

WROUGHT IRON ROOFS,
CHARGING-SCOOPS, COAL WAGONS,
COKE BARROWS, AND ALL WROUGHT
WORK CONNECTED WITH GAS-WORKS.

Particular attention paid to the Extension of Works and Repairs to Gasholders, Purifiers, Etc; also, Builders of Water Tanks, Oil Stills, Etc.

Refer to M. H. Jones, Easton Gas Co., Penn.
Franklin Woolman, Burlington Gas Co., N. J.
O. W. Goodwin, Camden Gas Co., N. J.
Benjamin Acton, Salem Gas Co., N. J.
D. H. Smith, Watkins Gas Co., Watkins, N. Y.
W. F. Warner, Owego Gas Co., N. Y.
E. Wilcox, Joliet Gas Co., Ill.
Messrs. Woodbury, Walter & Potter, Kalamazoo Gas Co., Michigan.
H. H. Fish, Utica Gas Co., N. Y.
W. J. Ball, Terre Haute, Indiana. (221-1yr.

PREMIUM GAS STOVES.

New, Cheap Clean, Simple and Healthful.

No odor, no dirt, no soot, no ashes, no coal box, no punching and renewing fires.

THE CAMBRIDGE GAS STOVE.

This truly scientific invention received the premium at the State Fair at St. Louis, and is being introduced at the West and also in the New England States with great success. Certificates of its excellence and superiority from some of our most scientific and influential men have voluntarily given, and will be furnished upon application.

These stoves may be seen in operation at Messrs. Bliss & Co.'s, 95 Bleecker street, or at No. 42 Pine street, Room 18, where information may be obtained.

WORTHINGTON'S STEAM PUMP.

Extensively used by

GAS-LIGHT COMPANIES,

For sale at greatly reduced prices. Also, a new and highly successful Pump, driven by water pressure, requiring no attention or repairs, and the most economical water motor yet constructed.

Patent Gates for Water and steam-stops.

HENRY R. WORTHINGTON,
61 Beekman-st. New York.

B. S BENSON,

MANUFACTURER OF

CAST IRON PIPES AND FITTINGS

FOR

GAS AND WATER MAINS.

All sizes from 3 to 30 inch cast vertically in 12½ feet lengths.

Office and Factory 52 East Monument street.

BALTIMORE MD. [184

THE AUBIN BALANCED

VALVE WATER METER,

(Used also for Oils and Liquors)

Is NOW IN USE BY MANY CITY WATER Companies, because of its Low Price, Simplicity, Durability, Accuracy under any Pressure, and, (a great advantage,) because it runs with less head than any other meter used.

Manufactured by H. Q. HAWLEY, Albany, N. Y.

J. S. HOBBIE & SON,

SUCCESSORS TO

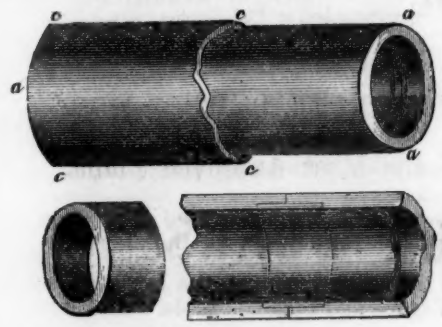
WYCKOFF, BROS. & CO.,

ELMIRA, N. Y.

ANUFACTURERS OF

WYCKOFF'S PATENT IMPERISHABLE

Wooden Water and Gas Pipe.

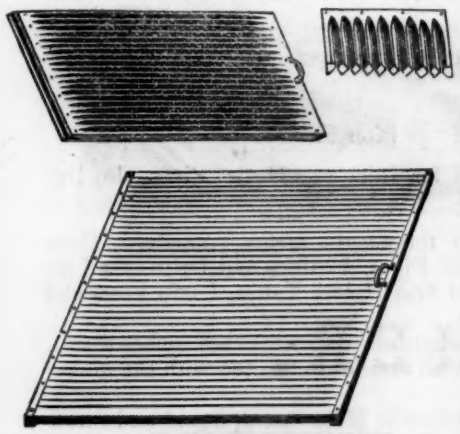


These Pipes combine]

Strength, Durability, and Economy.

The Water Pipes are the cheapest and best in use for watering Cities and Villages, conveying water to Railroad Tanks, Distilleries, Breweries, Tanneries, and water courses of every description.

Wyckoff's Patent Gas Pipe is less expensive than other kinds, more serviceable and more durable; being coated, inside and outside, with imperishable material, and impervious to air, gas or water, and warranted to give satisfaction. 219tf



J. L. CHEESMAN,

Manufacturer of Patent Conically and Diamond Slotted SOLID WOOD TRAYS.

The advantages of these Trays over those made of Iron, are economy (they being over 200 per cent cheaper than Iron, and will last twice as long), a greatly increased purifying surface, and a saving of time and labor in removing the lime, as it does not adhere to the smooth surface of the Wood Trays, as is the case with the Iron. The top cut represents the new diamond slotted or reversable Tray, a very superior improvement.

JOHN L. CHEESMAN,
151 and 153 Avenue C, New York.

A Ship Found in a California Desert.—By many it has been held as a theory that the Yuma desert was once an ocean bed. At intervals pools of salt water have stood for a while in the midst of the surrounding waste of sand, disappearing only to rise again in the same or other localities. A short time since one of these saline lakes disappeared, and a party of Indians reported the discovery of a "big ship," left by the receding waves. A party of Americans at once proceeded to the spot, and found imbedded in the sands the wreck of a large vessel. Nearly one-third of the forward part of the ship or bark is plainly visible. The stump of the bowsprit remains, and portions of the timbers of teak are perfect. The wreck is located forty miles north of the San Bernardino and Fort Yuma road, and thirty miles west of Los Palmos, a well known watering place on the desert. This road across the desert has been traveled for more than 100 years. The history of the ill-fated vessel can, of course, never be known, but the discovery of its decaying timbers in the midst of what has long been a desert, will furnish savans with food for discussion, and may, perhaps, furnish important aid in the elucidation of questions of science. —*Exchange.*

DENNIS LONG & CO.,

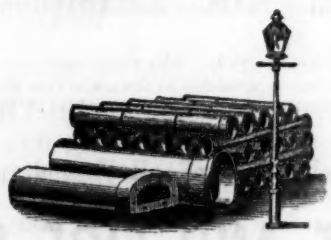
UNION PIPE WORKS!

LOUISVILLE PIPE FOUNDRY,

AND

Union Foundry and Machine Shops

LOUISVILLE, KY.



MANUFACTURE

CAST IRON GAS AND WATER PIPE.

All Pipe Cast Vertically in Dry Sand.

2 inch Pipes in 8 feet lengths. 3 inch to 60 inch cast in 12 feet lengths.

RETORTS AND MOUTH PIECES, LAMP POSTS CONDENSING PIPE, HYDRAULIC MAINS, PURIFIERS, DRIPS, ELBOWS, TS, CROSSES, SLEEVES, VALVES, &c., &c., &c.

GAS-HOLDERS.

And every description of work necessary for Gas or Water Companies.

P. MUNZINGER,

GAS ENGINEER,

WITH MORRIS, TASKER & CO.,

PHILADELPHIA, PA.,

Has now in press a set of Tables, showing the flow of gas through pipes from 1-8th to 72 inches diameter, under water pressure from 1-10th to 8 inches.

Gas Engineers and Superintendents in charge of Gas Works, will be furnished with a copy, gratis, on application to the author, as above. 259

BROOKLYN TUBE WORKS.

B. T. BENTON,

MANUFACTURER OF

WROUGHT IRON AND GALVANIZED

TUBES,

For Steam, Water, or Gas.

MANUFACTORY AND OFFICE,

Corner John and Adams Street, Brooklyn

ALSO

58 John Street New York. 171

R. D. WOOD & CO.,

MANUFACTURERS OF

CAST-IRON PIPE, RETORTS, &c.

Office, 400 Chestnut Street, PHILADELPHIA.

S. H. HENDERSON, Selling Agent,

No. 178 BROADWAY, 2ND FLOOR.

MORRIS, TASKER & CO.,

PASCAL IRON WORKS.

[ESTABLISHED 1821,]

PHILADELPHIA,

Manufacture Wrought Iron Welded Tubes for Gas, Steam or Water; Lap-Welded Boiler Flues,

GALVANIZED WROUGHT IRON TUBES,

ARTESIAN WELL PIPES,

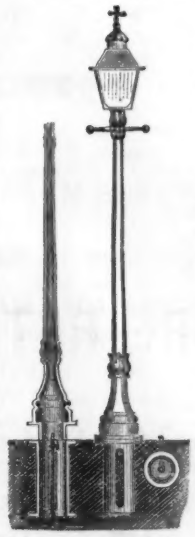
of Wrought or Cast-Iron, screwed together, flush inside and out; Gas-works Castings, Retorts and Bench Castings for Coal Gas-works,; Cast-Iron Street Mains, Bends, Branches, Drips, &c.

Gas and Steam Fitters' Tools, &c.

Stephen Morris. Stephen P. M. Tasker.
Thomas T. Tasker, Jr. Henry G. Morris.
Office and Warehouse, 15 Gold-street, New York.

BRANSON'S PATENT LAMP POST.

THE ADVANTAGES OF THIS PATENT POST over the old style, are as follows:



1st. The saving of the base or bottom part of the Post, when the column is broken, the Post being made in two parts. The broken column can be replaced by a new one, without disturbing the base.

2d. When the old style of post is broken, the bottom piece has to be dug out, which cannot be done in winter, or in wet weather: all this is obviated in this Post, as no digging is required. This style of Pos is especially desirable when flag stone sidewalks are used.

3rd. When a stoppage of gas in stand pipe occurs, the column can be lifted out, the pipe detached, cleaned, and replaced in fifteen minutes; no digging being required as is now done with the old Post.

4th. A lighter and better casting can be made from this patent, and it can be handled better, owing to its length and lightness.

5th. In case a broken column cannot be repaired, one third of the original cost is saved by the base being secured and perfect.

Rights for States, or the United States, on reasonable terms. Address, Editors GAS-LIGHT JOURNAL, 42 Pine street, N. Y.

Certificate.

ST. LOUIS, September 1, 1869.

I have examined a new Lamp Post, the Branson patent, and unhesitatingly pronounce it to be the best thing of the kind I have ever seen. Posts of this desccription have been erected in this city, and in my opinion this style of Post should be universally adopted, as I believe it possesses all the advantages claimed for it.

The St. Louis Gas-Light Company have adapted this Post and ordered a large quantity for immediate use.

THOMAS PRATT,
587–6m Sup. St. Louis Gas Works.

J. VAUGHAN MERRICK, W. H. MERRICK, JOHN E. COPE.

SOUTHWARK FOUNDRY,

FIFTH AND WASHINGTON STREETS,

PHILADELPHIA.

MERRICK & SONS, Engineers,

MANUFACTURERS OF EVERY DESCRIPTION OF GAS MACHINERY.

Retorts, Bench Castings, Condensers, Washers, Scrubbers, Wet or Dry Lime Purifiers, Coke Wagons, Fire Tools, Wrought Iron Grate Bars, Gas-holders, either Telescopic or Single, with Suspension Frames complete; Wrought Iron Roof-Frames, for Iron or Slate; Stop Cocks, Exhausters, Steam Pumps, Boilers and Tanks, Steam or Hand Air Pumps for proving Street Mains, Centre Seals, Governors, Wrought or Cast-Iron, Line Sleves for Purifiers, Hoisting Machines for Lifting Purifier Covers.

Address— MERRICK & SONS,
5th and Washington Sts, Philadelphia.

C. GEFRORER,

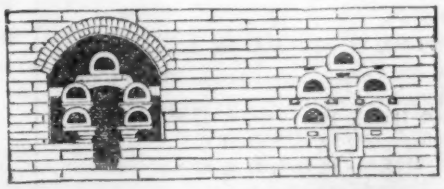
Manufacturer of

GAS-BURNERS,

For Lighting and Heating Purposes.

GAS HEATING AND COOKING APPARATUS; FITTERS' PROVING APPARATUS, &c.

529 Commerce st., bet. Market & Arch st., Phila., Pa



IMPORTANT TO GAS COMPANIES.

P. H. SPELMAN, MASON and BUILDER, No. 282 Third Avenue, corner 22d Street, New York, having made Bench Building and Setting Clay and Iron Retorts a pecialty for nearly twenty years, would respectfully inform those who are about Erecting new or Repairing old Works, that he is prepared to do work in any part of the United States or Canadas, on the most reasonable terms. Address as above. 251–6m

FOR SALE.—TWO PURIFIERS, ENTIRELY new, Cast Iron Frame, Wrought Iron Covers' 5 by 5 feet; five rows of Sieves, will purify 30,000 cubic feet per day. Inquire of HEARING & FLOYD, 740 Greenwich St., or T. Bland, 42 Pine St. 260—4t

MORRIS, TASKER & CO.,
PASCAL IRON WORKS,

PHILADELPHIA.—Established 1821,

STEPHEN MORRIS, THOMAS T. TASKER, Jr., STEPHEN P. M. TASKER.

FOR GAS WORKS MACHINERY, ADDRESS 209 SOUTH THIRD STREET, PHIL.

Manufacturers and Builders of Gas Works, &c., of all Descriptions, of the Most Approved Plans.

WROUGHT IRON ROOF FRAMES—For Sale, or Corrugated Iron Castings, with Cast Iron Cornice Gutter, Iron Doors and Frames, Wrought Iron Pivot, Blinds, Windows and all kinds of Castings and Smith Work for Buildings.

BENCH CASTINGS.—Retorts, and all Castings and Wrought Iron Work required for Setting them on the Latest Plan. Tar Gates, Wrought Iron Stand Pipes, Retort Lids, Cotter Bars, Coal and Coke Wagons and Stokers' Tools.

EXHAUSTERS.—Exhausters and Compensators, By-Passes to pass from 4,000 to 150,000 Cubic feet of Gas per hour, with Engines, Governors, Pressure and Vacuum Guages.

SCRUBBERS.—Single or Multitubular Scrubbers, with Self-Acting Pumps for Ammonia Water.

WASHERS.—Cataract and Single and Multitubular Spray Washers.

CONDENSERS.—Single and Multitubular Air and Water Condensers.

PURIFIERS.—For Purifying from 1,000 to 2,000,000 cubic feet capacity daily, with either wet or dry Lime, or Oxide of Iron, and with either Rivetted or Wrought or Cast Iron Lime Sieves.

CARRIAGES.—Movable Lifting Carriages for Purifiers, arranged either for Floor or Overhead use.

METERS.—Square and Round Meters of any capacity.

GAS HOLDERS.—Single Lift and Telescopic Gasholders, with Cast or Wrought Iron Suspension Frames.

GAS GOVERNORS.—Station Governors, with Regulating and Indicating Columns for Inlet and Outlet Pipes, also Dry Governors with Flexible Diaphragms for Underground Pipes.

STOP VALVES.—Double Faced Stop Valves for Gas or Water, from three inches to forty-eight inches diameter. These Valves are proved on both sides, with a heavy Water Pressure, Flange and Bell Pipes, Fittings and Drips of all descriptions. Steam Boilers and Hot Water Apparatus for Heating, Building, and Gas Holder Tanks, Lamp Posts and Lanterns.

Best quality American Charcoal Iron Boiler Tubes Wrought Iron Tubes from one-eighth of an inch to ten inches diam., with all kinks of Fittings, Valves and Cocks, Gas and Steam Fitters' Tools, and all articles connected with the manufacture of Gas, Steam or Water.

Sole Manufacturers of P. Munzinger's Patent Purifiers, Center Seals, Adjustable Hydraulic Main Stand, Stand and Straddle Pipes, and Multitubular Water Condenser.

Mr. P. MUNZINGER, Gas Engineer, has been connected with our Establishment as Engineer and Designer, and in charge of the Gas Works Department for the past fifteen years.

Plans, Specifications, and Estimates furnished, for Lighting up Towns, Cities, Factories, and Public Buildings, etc., etc., with Gas from Coal, Rosin, Wood, or Oil.

We would refer to the Gas Machinery erected by us, and in operation, at the following places:

Philadelphia, Pa.
Williamsport, Pa.
Altoona, Pa.
Willkes Barre, Pa.
Honesdale, Pa.
Harrisburgh, Pa.
Erie, Pa.
Hanover, Pa.
Easton, Pa.
Lancaster, Pa.
Lock Haven, Pa.
McKeesport, Pa.
Allentown, Pa.
Lebanon, Pa.
Uniontown, Pa.
Washington, Pa.
Hudson City, N. J.
New Brunswick, N. J.
Salem, N. J.
Newark, N. J.
Freehold, N. J.
Englewood, N. J.
Jersey City, N. J.
Elizabeth, N. J.
Camden, N. J.
Flemington, N. J.

Metropolitan Works, N. Y. City.
Binghamton, N. Y.
Rome, N. Y.
Utica, N. Y.
Port Jervis, N. Y.
Elmira, N. Y.
Niagara Falls, N. Y.
Flat Bush, N. Y.
Westchester Co., N. Y.
Batavia, N. Y.
Fredonia, N. Y.
Columbus, Ohio.
Mansfield, Ohio.
People's Works, Cleveland, Ohio.
Newark, Ohio.
Salem, Ohio.
Wooster, Ohio.
People's Works, Chicago, Ill.
Chicago Gas-Light and Coke Co., Ill.
Jacksonville, Ill.
Peoria, Ill.
National Asylum for Discharged Volunteer Soldiers, Milwaukee, Wis.

Detroit, Mich.
La Porte, Ind.
Lawrence, Kansas.
Salem, Oregon.
Port-au-Prince, Cal.
San Jose, Cal.
Stockton, Cal.
Illinois State Penitentiary, Joliet.
Hartford, Conn.
Hagerstown, Md.
Peoples Works, Baltimore, Md.
Elkton, Md.
Milledgeville, Ga.
Augusta, Ga.
New Orleans, La.
Shreveport, La;
Louisiana Ice Manufacturing Co.
Nashville, Tenn.
Murfreesboro, Tenn.
Jackson, Miss.
Houston, Texas.
Galveston, Texas.
And a number of others.

☞ See page 166 for Index to Advertisements.